RAMSEY COUNTY

Resilient Ramsey County

Building Internal Capacity for Climate Adaptation

A Resilient Communities Project

HUMPHREY SCHOOL OF PUBLIC AFFAIRS
UNIVERSITY OF MINNESOTA

May 2019

Max Dalton
Maia Guerrero-Combs
Kai Peterson
Hannah Rank

Advisor: Fred Rose
Client: Ramsey County
Final Presentation: May 15, 2019

Table of Contents

Acknowledgements

We would like to thank those that helped us with this report, especially Mary T'Kach, who provided indispensable information and assistance as the project sponsor at Ramsey County.

Thank you to the other staff at Ramsey County who shared their expertise, including Paul Allwood, Cheryl Armstrong, Bharat Balyan, Anne Barry, Ling Becker, Johanna Berg, Molly Churchich, Emily Colby, Kari Collins, Lidiya Girma, Zack Hansen, Brian Isaacson, Patrick McCoy, Lee Mehrkens, Ted Schoenecker, and Elizabeth Tolzmann.

We would also like to acknowledge the staff members from other local governments that we highlighted in our case studies, whose insights deepened our analysis: Chris Kleist from the City of Duluth, Juan Reyes from Fairfax County, Virginia, and Lisa Kloop, Erika Luciani, and Jennifer Moon from Miami-Dade County, Florida.

Finally, we would like to thank those affiliated with the University of Minnesota who assisted our project: Mike Greco, who leads the Resilient Communities Project, Professor Bonnie Keeler, and Fred Rose, our project advisor.

About the Resilient Communities Project (RCP)

The Resilient Communities Project is a program of the Center for Urban and Regional Affairs (CURA) at the University of Minnesota designed to "build community capacity to survive, adapt, and thrive in the face of changing social, economic, and environmental conditions." This is done through University of Minnesota-based partnerships with local government entities. The intent of each project is to build community resilience through social, environmental, livability, and economic issues that these entities have identified. City or county staff work closely with students to provide them with the necessary information to complete the project.[1]

For the 2018-19 academic year, RCP selected Ramsey and Scott Counties as its partners. Ramsey County identified 18 potential projects to partner with RCP on that included addressing issues of transportation barriers, voter turnout, and environmental issues such as resiliency and food waste and insecurity.[2]

Executive Summary

Ramsey County and its residents face increased physical, social, health, and financial risks due to climate change. The State of Minnesota and Ramsey County have both conducted climate change vulnerability assessments in the past five years. Each concluded that the risks posed by climate change are greatest for vulnerable populations that include people of color, those experiencing poverty or homelessness, those without access to a car, and those who lack air conditioning at home. Ramsey County's 2040 Comprehensive Plan defines resilience as "the capacity to respond, adapt, and thrive under changing conditions" and identifies resilience as a priority.[3] The 2040 Comprehensive Plan states that "Ramsey County's resiliency strategies will focus on mitigation and adaptation," yet Ramsey County currently lacks a strategic approach to build resilience to adapt effectively to climate change.

This report provides a road map for Ramsey County to build its internal capabilities to proactively address climate-related risks and its associated impacts on residents' health and well-being. It also provides a timeline for implementing these changes. Our recommendations align with Ramsey County's four goals and its eight 2019 strategic priorities and are based on learnings from Ramsey County staff and case studies. Most importantly, given the connection between climate impacts and vulnerable populations, our recommendations promote racial equity in Ramsey County. Our recommendations are as follows:

1. **Reconstitute the Energy Governance Team (EGT) as the Resilience Governance Team (RGT)** – The EGT has made progress in setting goals and policies to improve energy efficiency, but Ramsey County must also consider ways to help its residents confront the impacts associated with climate change. Given many current members on the EGT should also be involved in a cross-departmental adaptation team, it makes more sense to expand the scope of the EGT than to form a new committee with related goals and overlapping projects. The RGT should consist of all existing EGT members and also include leaders from the Emergency Management & Homeland Security and the Enterprise Risk Management teams.

2. **Hire a Resilience Manager** – A dedicated staff member will assess risks, evaluate opportunities, partner with department staff, engage community stakeholders, and facilitate cross-service-team collaboration on a more regular basis than the RGT can. The Resilience Manager would be expected to work closely with department directors, the Enterprise Risk Manager, and staff currently working to mitigate the county's climate impact. Given the need to interact with many departments and service teams, the Resilience Manager should be part of the Policy & Planning team.

3. **Build a Digitized Asset Management System that Incorporates Risk Assessment** – The Departments of Public Works, Property Management, and Parks and Recreation are already partnering to develop an asset management system. Asset management systems can play a critical role in assessing the likelihood of county assets failing, including from extreme weather events, and the magnitude of impact if a failure occurs. Ramsey County's asset management system should be designed to assess risks of asset failure and potential impacts on county services and residents. This will allow county departments to incorporate risk mitigation into their planning and budgeting.

4. **Increase Reporting to Commissioners** – There is opportunity for Ramsey County to take a leading role among Minnesota counties in building climate resilience. Biannual reporting to the Board of Commissioners through

workshops, briefs, and/or presentations will increase awareness among commissioners on how climate change impacts residents, create alignment on a vision for Ramsey County as a sustainability leader, and foster accountability among staff.

5. Create Awareness of Climate Resilience to Attract Talent and Facilitate Culture Change – An expected wave of staff retirements over the next decade presents a challenge and opportunity for Ramsey County. Becoming a resilience leader can help the county attract new employees, and facilitating awareness about resilience priorities will help retain those employees and change the county's culture. The Resilience Manager should work with Human Resources and Communications to incorporate resilience into internal and external communications, talent attraction strategies, employee on-boarding, and leadership training.

6. Create a Plan for Participatory Community Engagement on Climate Adaptation Work – It is important to include the perspectives of those who will be most affected by climate change. Public engagement processes should include diverse perspectives and facilitate an exchange of views rather than just as a mechanism to inform. Once the county has taken the necessary internal steps for climate adaptation planning, it should create an external participatory engagement plan.

Implementing these recommendations will create a governance structure that enables Ramsey County to become more resilient to the challenges posed by climate change. It will put residents first, take action against the inequitable impacts on health and well-being posed by climate change, and foster more cross-service team collaboration. In short, it sets the stage for a Resilient Ramsey County.

Introduction

As the prospect of extreme weather events and weather-related damage and displacement increases in a changing climate, people increasingly rely on their local governments for help. Ramsey County is no different. Ramsey County and its residents face increased physical, social, health, and financial risks due to climate change, and the county lacks a strategic approach to mitigate these risks or build resilience to adapt effectively to them. In 2016, Saint Paul-Ramsey County Public Health conducted a Climate Change Vulnerability Assessment (CCVA), which identified pockets of the county most susceptible to the impacts of extreme weather events and climate change, including where vulnerable populations were concentrated. The CCVA identified a need to take further action to mitigate these impacts. Similarly, Ramsey County's 2040 Comprehensive Plan cites resilience as a strategic priority. It defines resilience as "the capacity to respond, adapt, and thrive under changing conditions,"[4] yet Ramsey County currently lacks a plan to tackle resilience as called for in its comprehensive plan.

Given these existing and increasing risks and the need to address them, Ramsey County asked our team, through the RCP, to make recommendations for how the county can improve its internal capabilities to assess and proactively address climate-related risks and its associated impacts on residents' health and well-being.

Ramsey County recently finalized its 2019 Strategic Plan and strategic priorities. The eight priorities it identified, along with the county's four stated goals, guide the county's work. The county prioritizes projects that advance these goals and priorities. In alignment with its strategic priorities, any action Ramsey County takes to advance climate change adaptation and resilience planning must also incorporate a racial equity lens, put residents first, have a meaningful community engagement and empowerment component, and build prosperity and stability. Climate change is not just a distant possibility anymore -- Ramsey County's climate is already changing, and the negative effects are felt most by people of color and residents who lack resources. Ramsey County has a responsibility and opportunity to put its most vulnerable residents first and design its services so residents adapt and thrive in the face of a changing climate.

If Ramsey County takes focused, strategic actions to build its adaptation capacity for climate change now, it will be better positioned for the future. Concerted, smart investments of time and resources on the front-end will lead to better long-term outcomes.

The following report contains information about best management practices in coalition building within a local government to coalesce around climate change adaptation planning. These best practices emerged from analysis of detailed case studies from leading counties and cities in the U.S. It also incorporates research into risk management and findings from interviews with key Ramsey County staff conducted by our team. Finally, this report lays out tangible recommendations to institutionalize a framework for climate change adaptation planning within the county.

Project Purpose & Scope

Although Ramsey County may also focus on climate mitigation by reducing its environmental impact, an increasingly urgent need for its citizens is to advance adaptation. Climate change's effects on human health and well-being among vulnerable populations are of particular concern. Adaptation strategies promote risk communication, community and infrastructure planning, and emergency preparedness.[5]

Minnesota is already experiencing the effects of climate change in several ways:

- An increase in average temperature, with winter and overnight low temperatures rising most quickly;
- A potential increase in high-humidity days (≥70°F);
- More localized precipitation patterns, including heavy precipitation events and deficits.

These climate changes are expected to worsen air quality, compromise food and water quality and supply, and lead to more vector-borne diseases. Factors such as the urban heat island, denser development, many impervious surfaces, and the concentration of vulnerable populations put Ramsey County at comparatively greater risk of climate impacts than most of Minnesota. Since vulnerable populations include people experiencing poverty or homelessness, people of color, and those without access to a car, the risks posed by climate change are intricately linked to Ramsey County's priority of advancing racial and health equity.

Given these existing and increasing risks, our team was tasked to help Ramsey County build its internal capabilities to assess and proactively address climate-related risks and its associated impacts on residents' health and well-being.

Our team focused primarily on Ramsey County's internal structure and decision-making processes. Although Ramsey County may eventually partner with other entities -- including municipalities within the county -- to advance its climate adaptation work, assessing those opportunities was outside our scope of work. We were charged to recommend policies and provide a roadmap to help the county incorporate resilience and adaptation strategies into its programming and budgeting.

Our project sought to answer three research questions:

1. What internal policies can Ramsey County implement to adapt to climate change?
2. What steps can Ramsey County take to build leadership capacity so that department directors and other leaders can effectively plan for, prioritize, and carry out climate adaptation strategies that will reduce risks for the county and its residents?
3. How can Ramsey County integrate climate change resilience strategies into the county's budget, decision-making processes, and departmental operations?

The remainder of this report will provide information and recommendations to help Ramsey County develop internal strategies and policies to be more adaptable to climate-related risks and incorporate adaptation strategies into its decision-making.

Ramsey County's Climate Change Resilience Efforts

All levels of government in the State of Minnesota are thinking about how the changing climate will affect their residents. Both the State and the Metropolitan Council have developed goals for driving mitigation efforts within its organization and supporting local governments' efforts (for more information on climate change adaptation efforts at the State of Minnesota, see Appendix 1. For more information on climate change adaptation efforts at the Metropolitan Council, see Appendix 2). Few counties in Minnesota have updated their internal processes to accommodate extreme weather events and resilience planning in the face of increased risks posed by climate change. There is opportunity for Ramsey County to take a leading role within the state and become a model for other counties to follow. Listed below are the main efforts Ramsey County has taken to mitigate and adapt to its changing climate.

Ramsey County's 2040 Comprehensive Plan states that resilience "describes the capacity of a system to maintain functionality or recover in the event of a disruption or disturbance." The resilience of a local jurisdiction "is important when chronic stressors or sudden shocks threaten widespread disruption or the collapse of physical or social systems."[6] Resiliency includes:

- Planning for extreme weather events, such as prolonged heatwaves.
- Improving health and well-being of residents.
- Ensuring economic prosperity and opportunity for all.

Ramsey County has made strides in identifying how certain expected weather events could affect its residents. In 2016, Saint Paul-Ramsey County Public Health conducted a Climate Change Vulnerability Assessment, which showed the areas where a higher probability of extreme weather effects like flooding, extreme heat or cold, and poor air quality overlapped with geographic concentrations of vulnerable populations. Poor and low-wealth residents, residents of color, residents without access to adequate healthcare, and residents with limited English skills are among those who are more at risk of exposure to climate-related risks and/or might require additional services from local government if exposed.

Geographic Information System (GIS) analysis conducted as part of the CCVA shows the greatest effects of extreme weather events will "likely be greatest in downtown Saint Paul, areas north and slightly south of I-94, areas around I-35E, portions of Saint Paul's East Side and West Side, along West 7th Street, and in some suburban pockets, unless land use in these areas changes to include more green spaces."[7] Some of the identified areas not only represent pockets of vulnerable communities, but also areas of growth and healthy tax bases within the county, indicating a significant financial risk to the county.

The 2016 CCVA provided a useful snapshot of the vulnerabilities facing county residents and geography. The data has since been updated to include more recent estimates, yet the county still lacks forecasting capabilities. Given that the CCVA was overseen by Public Health, the assessment primarily focused on the potential effects of climate change on human health. This is an important consideration, but it does not represent the full scope of Ramsey County's vulnerabilities to climate change.

In early 2018, Ramsey County formed an Energy Governance Team (EGT), a multi-departmental committee tasked with improving the county's energy efficiency and greenhouse gas (GHG) mitigation efforts through planning,

projects, and policies. The EGT has created a Strategic Energy Plan. More recently, it completed a centralized fleet guidance document and a work plan through 2021, added energy considerations to capital improvement programming, and prepared an initial life-cycle financial analysis tool.[8]

Ramsey County's 2040 Comprehensive Plan outlines key components of resilience for the county. In its key themes, the plan names working to mitigate energy disruptions through micro-grids and increasing renewable energy options, part of which the EGT was tasked with addressing. The plan set a goal to reduce GHG emissions by 80% by 2050 compared to 2008 levels and suggests future mitigation planning may be key to proactively stave off the worst effects of a changing climate.

Ramsey County has made strides in the aforementioned areas, but there is no multi-departmental effort to make internal process improvements for addressing climate change adaptation. Yet changes within the county, outlined below, provide an opening to integrate climate change adaptation into its internal processes.

Ramsey County's Stated Goals & Strategic Priorities

Ramsey County is guided by four goals in its programming, planning, and projects (the full list of Ramsey County goals and strategic priorities are listed in Appendix 3). These goals, along with its strategic priorities, guide county staff when formulating their programming and budget priorities and are integral to understanding why adaptation planning should be integrated within the county.

In 2015, Ramsey County's departmental structure changed to a service team model in which four deputy county managers oversee their respective service teams: Health and Wellness, Information and Public Records, Economic Growth and Community Investment, and Safety and Justice. Within each service team is an array of county departments largely aligned with the service team's objectives. This restructuring demonstrates the county's desire to de-silo its organization and foster more cross-departmental collaboration.

The recent organizational restructuring, when paired with leadership changes and a relatively new county manager, presents an opportunity to reconfigure program priorities and internal processes. Cross-service team collaborations are rewarded by the county leadership and the budget process, providing an opening for a cross-service team effort to drive resilience.

Internal process improvements with regard to climate adaptation planning will help further the county's goals and strategic priorities in a variety of ways, including:

- Enhance service delivery for those most vulnerable to climate change, thus strengthening residents' well-being;
- Position Ramsey County to identify gaps in community engagement and where the county could use further public input on policies and programs; and
- Increase the county's fiscal responsibility and planning capacity by identifying vulnerabilities in physical assets and opportunities to incorporate resilience in redevelopment projects.

Case Studies from Other Counties & Cities

The risks and impacts of climate change will be felt by everyone, but not to the same magnitude or in the same ways. Other counties and cities in the United States have begun adapting to the impacts of climate change. The following case studies were chosen because of the success they have had, a variety in methods of action, and geographic diversity. The specifics of the examples do not perfectly align with Ramsey County, but Ramsey County can learn from these cases and adapt aspects to meet its own needs. In researching these case studies, we identified some recurring themes and best management practices.

Best Management Practices

1. **Leadership places an emphasis on sustainability practices**
   - Leadership can provide a unified vision and concrete direction.
   - Priorities voiced by leadership keeps the issue top-of-mind.
   - Leadership has broad visibility to prioritize what the residents need and want most.
   - Leadership can encourage and enforce change.

2. **Forming teams, committees, or councils drives sustainability practices**
   - Cross-departmental teams ensure integration of county operations.
   - Teams help generate buy-in from across the county by providing representation.
   - Representatives from departments offer perspective to others on the team.

3. **Buy-in is important for success**
   - Buy-in must be approached from both the top-down and the bottom-up.
   - Cross-departmental groups can help facilitate this process.
   - Introducing sustainability from the start makes future integration a natural process.

4. **Federal and state policies provide a general direction, but local governments should go further**
   - Laws can be an initial guide or mandate, but successful counties go beyond what is required by law.
   - State and federal laws are insufficient to build resilience to climate change.
   - Successful counties recognize deficiencies and take action on behalf of their residents' long-term interest.

5. **Specific plans with tangible goals and realistic timelines are necessary**
   - Lofty, unrealistic goals do not work.
   - Successful counties frame what they are trying to accomplish in a context that will ensure success.
   - Ambiguity can slow momentum and inhibit continued action.

6. **Setting guidelines reduces paralysis in decision-making**
   - A decision tree or process that removes barriers to action leads to success.
   - Complete information never exists; the process must begin despite the lack of complete information.

7. **Reporting and follow-up are necessary for accountability**
   - Accountability ensures continued action.

- Reporting gives "bragging rights" and sets and example for others to follow.

8. **Recognition that climate change impacts will increase demand for county services**
   - Local governments see that climate-related impacts will strain the services they provide and plan accordingly.
   - Impacts on the most vulnerable populations will drive need for additional services.

9. **Recognition that climate change impacts will impede the ability to provide services**
   - Integration and future planning helps soften the blow of significant events.
   - Failing to adequately plan now will lead to higher costs in the future.

10. **Risk assessment is critical for prioritization and financial planning**
    An overview of risk assessment and how it is used by governments to benefit the public can be found in Appendix 4
    - Priority is given to projects that address where risks are most likely and the potential consequences are greatest.
    - Addressing risks proactively is usually more cost-effective.

11. **Asset management planning incorporates ongoing maintenance**
    A description of how local governments use asset management plans, including an example from the City of San Diego, is provided in Appendix 5
    - Maintaining assets keeps financial impacts at a minimum and allows better prioritization of projects.
    - Adaptable systems facilitate better reaction when proactive practices prove insufficient.

Alameda County, CA

The detailed case study for Alameda County, CA can be found in Appendix 6

Alameda County's Climate Action Plan, passed in 2010, is implemented by the county's Climate Action Team. With pressure from community members and leadership backing, staff developed the "Climate Action Plan for Government Services and Operations" within fiscal constraints. A cross-agency process was developed to engage county employees and decision-makers and generate buy-in.[9] With strong support from the County Administrator and other key agency heads, the first step was to designate Agency Climate Coordinators (ACCs) to form a committee of 24 members from across 19 county agencies. The second step was to set up a climate protection intranet site where all county employees were invited to submit their ideas relating to climate action, resulting in more than 500 submissions. Priority was given to measures that 1) reduced GHG emissions; 2) achieved other environmental or social benefits; 3) were cost effective within individual county agencies; and 4) advanced existing county policies and goals. The team winnowed the initial list of submissions to 80 and ranked them into three tiers of the climate framework developed by the ACCs.

An important component of Alameda County's process was pairing fiscal responsibility with county-wide involvement. Alameda County's approach encouraged ownership by individuals within the county and generated county-wide buy-in and success. By developing a supervisory team but also designating individuals within each agency to champion the work, the county built a multi-level accountability framework that kept processes moving forward. A key takeaway for Ramsey County is that it is important to involve county staff at all levels to create a culture of awareness and buy-in and that decisions must be fiscally responsible and realistic. Another consideration is that the success of Alameda County was the result of pressure from the community and county leadership but was guided by a dedicated team of agency heads.

Fairfax County, VA

The detailed case study for Fairfax County, VA can be found in Appendix 7

In 2004, Fairfax County's Board of Commissioners adopted its first "Environmental Vision," which is broken into seven areas: Land Use, Transportation, Water, Waste Management, Parks & Ecological Resources, Climate & Energy, and Environmental Stewardship. The county publishes an annual Sustainability Initiatives Report, in which it outlines its accomplishments and a strategic plan for moving forward. Among other findings, this report recognized the need for internal collaboration and coordination, leading staff to form an Energy Core Team. This team is divided into the Environmental Coordinating Committee (ECC) and the Energy Efficiency and Conservation Coordinating Committee (EECCC). Together, these teams are responsible for setting goals and priorities for the county, making decisions, and moving sustainability priorities forward.

Fairfax County's success is the direct result of guidance from the county board and the Energy Core Team. Together, these leadership groups have provided a clear direction for the county's work and created active participation in the processes from relevant staff. Fairfax County is thus an example of leadership-led direction that moves the county forward on sustainability initiatives. Additionally, a dedicated team within the county maintains momentum by setting and helping achieve goals, similar to Ramsey County's Energy Governance Team. Having adopted its initial vision in 2004, Fairfax County has been able to revise its plan and make itself accountable for achieving the plan's goals.

Hennepin County, MN

The detailed case study for Hennepin County, MN can be found in Appendix 8

Similar to Ramsey County, Hennepin County has a diverse array of green and sustainability initiatives, but has not coordinated them into a single countywide plan. Two noteworthy initiatives Hennepin County has initiated are:

- *Hennepin County Sustainable Development Strategy*: Hennepin County's Sustainable Development Strategy aligns resources to integrate multi-modal transportation, economic development, housing, and community choices.[10]
- *Cool County Initiative*: Like Fairfax County, Hennepin County was a founding member of a coalition of counties across the U.S. taking action to reduce GHG emissions. The Board of Commissioners adopted goals to reduce GHG emissions from 2005 levels by 15% by 2015, 25% by 2025, and 80% by 2050.[11] The initiative relies on reducing energy use and using more renewable energy in addition to green building design, efficient vehicle fleet management and transportation practices, and other targeted greenhouse gas emission reduction programs.

As geographic neighbors with similar demographics, Ramsey and Hennepin Counties face almost identical challenges when it comes to climate risks and expected impacts. While neither Ramsey nor Hennepin Counties has developed a county-wide plan, both understand the necessity of leadership and buy-in to succeed. In some respects, Ramsey County has gone a step further than Hennepin in assessing its climate-related risks thanks largely to its CCVA and by commissioning this report.

King County, WA

The detailed case study for King County, WA can be found in Appendix 9

King County has two focus areas related to climate change: Climate Action and Equity & Social Justice. These two focuses are each guided by an action plan:

1. *2015 Strategic Climate Action Plan (SCAP):* King County recognizes that impacts from climate change are already occurring and will continue to occur in the future, even if greenhouse gas emissions (GHGs) are drastically cut. Therefore, the SCAP outlines strategies to integrate climate change preparedness into the operations and maintenance of infrastructure, programs, and natural resources, the provision of public services, and partnerships with local governments, community groups, and businesses.[12]
2. *The Equity & Social Justice Plan (ESJP)*: In 2008, King County took a more strategic and coordinated approach to addressing social, economic, and environmental disparities. Prior to the development of the ESJP, departments addressed inequalities individually. The plan is divided into six goal areas: Leadership, Operations, & Services, Plans, Policies, & Budgets, Workplace & Workforce, Community Partnerships, Communication & Education, and Facility & System Improvements.

King County recognized the connections between climate change and the social impacts it has on its most vulnerable residents. By developing interconnected plans, King County uses a multi-pronged approach to address climate change and the most vulnerable populations who will be impacted. The two separate plans can act independently to address specific issues but overlap in other areas. King County's approach uses a resident-focused mindset, recognizing that the county's services are mostly relied on by those most likely be impacted by climate change. Like Ramsey County, King County emphasizes equity issues. Using King County's approach as a model, Ramsey County can address issues of inequity within the county by addressing climate-related risks.

Miami-Dade County, FL

The detailed case study for Miami-Dade County, FL can be found in Appendix 10

The guidance for Miami-Dade County's sustainability initiatives is derived from the Office of Sustainability's GreenPrint Plan.[13] The plan frames how the county and community will achieve future resilience through a multi-pronged approach focused on the economy, urban environments, mobility, and environmental stewardship. The plan is comprised of seven focus areas: Strong Connections, Leadership, & Commitment, Water & Energy Efficiency, Our Environment, Responsible Land Use & Smart Transportation, Vibrant Economy, Healthy Communities, and a Climate Change Action Plan. The GreenPrint Plan includes an implementation table broken into subsets of goals and strategies, identifying leaders, partnerships, and funding needed. It quantifies impacts where possible and provides an action framework within the county. Both residents and county staff recognize that climate change and its impacts are occurring now and that action is necessary to mitigate the worst of these impacts.[14]

Miami-Dade County's GreenPrint Plan lays a strong foundation for the county's sustainability efforts. With strong support from both the top-down leadership and frontline county staff, Miami-Dade's success lies in a combination of strong planning, county-wide buy-in, and recognition of the impacts of climate change on residents. The plan also emphasizes hitting targets and outlines specific timelines to accomplish county goals. In order for Ramsey County to be successful like Miami-Dade County, it needs to create and stay committed to a tangible climate action plan while also ensuring there is county-wide commitment to the plan. Additionally, Miami-Dade County is considering the impacts of climate change in the design and delivery of its services. Recognizing the potential for service disruption will help Ramsey County gain traction in advancing climate adaptation.

City of Duluth, MN: 2012 Flood Recovery Efforts

The detailed case study for the City of Duluth case study can be found in Appendix 11

In 2012, the City of Duluth, MN experienced one of the worst flooding events in its history. Over the course of two days, the city was inundated with rainfall and had ten inches of standing water, which caused flooding. The flood caused massive damage to infrastructure and streambeds crucial to stormwater management. The city, with a mix of funds from the state and federal government, undertook a major cleanup and upgrade effort, and increased the capacity of most of its stormwater systems to accommodate the most recent rainfall projections. Moving forward, Duluth has better infrastructure and protocols to prevent flooding, including recommendations for future projects to increase the city's stormwater capacity. Two major components that made this work successful were funding capacity and maintenance. Though Duluth secured significant funding for cleanup efforts, these were not enough to completely overhaul its extensive underground stormwater system and streambeds. Thus, Public Works created a comprehensive risk assessment matrix to determine which projects should take priority and then formed cross-jurisdictional teams to complete work done efficiently and effectively. Even with upgraded culverts, streambed protections, and new runoff capacity, the stormwater manager for the city emphasizes that timely maintenance is crucial.

The need to evaluate public assets and their vulnerability is relevant to Ramsey County. As Chris Kleist, former stormwater manager and current supervisor for City of Duluth Public Works, noted, even the best culvert in the world, if blocked with tons of debris, will cause flooding and backups.[15] To best prepare for future events, Ramsey County needs to understand its current infrastructure its potential failure. The City of Duluth has designed a more preventative approach but only in response to a significant weather event that caused widespread damage. A takeaway for Ramsey County is the importance of proactive planning with sufficient information for asset maintenance and replacement that accounts for the possibility of large-scale events. A system and plan that considers the likelihood of risk and the potential magnitude of impact makes the system more resilient to shocks.

Key Learnings from Interviews with County Staff

During the information-gathering stage of our project, team members conducted qualitative interviews with Ramsey County staff members. Over the course of more than a dozen interviews, team members identified recurring trends and key ideas to inform our report recommendations. These concepts are synthesized below:

1. Ramsey County prioritizes actions and programs based on its overarching goals

- New efforts must be linked to the county's goals and strategic priorities.
- "Residents first" orientation (as laid out in strategic priorities) guides key decisions.
- Racial and economic equity are important considerations.

2. Ramsey County's culture is siloed, but the service team model has helped

- The service team structure has fostered more cross-departmental collaboration within service teams, but a shortage of meaningful cross-service team dialogue persists.
- Staff approve of the service team model while still recognizing room for improvement.
- The geographic dispersion of offices inhibits collaboration.
- Prioritizing cross-service team partnerships in budgeting has incentivized more collaboration.
- The EGT is an example of developing cross-service team collaboration, however, the cross-departmental nature makes accountability for goal achievement more difficult.

3. County departments internalize a culture that focuses on defined responsibilities

- Programs and initiatives are administered by departments based on the larger organizational structure, while individuals' actions are motivated by responsibilities in their job descriptions.
- New initiatives to tackle cross-departmental challenges require an executive champion or two and a formalized structure to enable a collaborative approach.
- Staff is receptive and responsive to leadership directives.

4. Short-term goal-setting mindset inhibits long-term planning

- The county's low tax base and high service needs mean county staff primarily react to immediate problems and concerns and are less focused on addressing long-term challenges.
- Extreme weather events and climate change impact residents and county services in a variety of ways, but many departments do not think of these consequences in terms of climate adaptation or resilience.
- The Public Health Department is somewhat further along than others in considering how climate change will impact residents' needs and the county's work, but it lacks the capacity to build resilience alone.

5. Funding for environmental projects has mostly been directed to soil cleanup and energy efficiency, but there is opportunity to think more broadly

- Loans and grants for green infrastructure are available, though Ramsey County lacks the staffing capacity to seek these funds.
- Many counties levy for environmental initiatives but Ramsey County does not.

6. Commissioners care about resilience but have not coalesced around a unified approach

- Grounding new initiatives in previously defined county goals and priorities is necessary.
- Commissioners work best at reacting to plans given to them by staff.

Recommendations

Our recommendations, as outlined below, follow a logical progression. Each item has associated inputs (such as staff time, monetary costs, etc.), outputs (such as reports, technology, etc.), and expected outcomes. To ground our recommendations in a logical form, our team devised a logic model for change that visually represents what Ramsey County can expect to see with regards to changing practices and capacity as a result of the work it puts in.

Logic Model

INPUTS	OUTPUTS	OUTCOMES AND IMPACTS
Staff Time/Resources for committee	Strategic Adaptation Policy Plan + Adaptation Work Plan	*Short Term*: Cross departmental planning for climate events that is proactive, nimble and continuous county-wide move toward adaptation and prevention mindset *Long Term*: Institutionalized system to prioritize climate adaptation planning
Funding for Resilience Manager position; Staff time of Resilience Manager	Adaptation toolkit for departmental use + Convene committee to implement projects	*Short Term*: Streamlined, cyclical system for risk management for assets; Position facilitates conversations based on prevention strategy and mitigating costs *Long Term*: Dedicated position for strategic adaptation will help facilitate a culture shift within Ramsey County, de-siloing and interdisciplinary knowledge transfer
Property Management, Public Works & Parks staff time to create and implement Asset Management System; Staff Time to create Risk Assessment Matrix	Asset Management System (incorporates risk assessment matrix)	*Short Term*: Easily accessible information on assets. Risk assessment portion increases visibility of need and facilitates streamlined, preventative, ongoing maintenance projects *Long Term*: Cost savings for upfront investment realized, as small yet cumulative asset management issues are anticipated and systematically tackled as they arise
Funding to create Asset Management System	Asset Management Plan that incorporates climate change adaptation, and mitigates risk	*Short and Long Term:* Living document provides best management standards and shows that the county prioritizes prevention, adaptation, and resilience strategy

ASSUMPTIONS

Our theory of change model, or logic model, has a set of assumptions that guides its logical progression. For instance, it is assumed:

- Funding exists/will exist to hire a Resilience Manager, likely by reallocating funding from departing staff.
- The vendor Ramsey County identifies for its Asset Management System can incorporate risk assessment into its software.
- The Board of Commissioners will support building the county's climate adaptation capacity.
- Time/resources exist in current work plans to facilitate recommendations in the timeframe recommended.
- The EGT is willing to expand its scope to include adaptation.

LIMITATIONS

Our logic model also recognizes limitations. For instance we recognize:

Time limitations

- Our team had limited time to interview staff for their insight into this project.
- Our team had limited time to interact with staff from other counties to inform case studies.
- Ramsey County has existing time frames for implementing projects without the addition of the recommendations from our team.

Budget Limitations

- Our team could not inform the previous budget planning process.
- Our team can only recommend for future budget planning - which is already underway.
- Ramsey County has a low tax base and other pressing priorities.

Recommendation 1: Reconstitute the Energy Governance Team as the Resilience Governance Team

Goals & Strategic Priorities Alignment: Goals 1, 2, 3, and 4; Strategic Priorities 2, 6, and 8
Best Management Practices Alignment: 1, 2, 3, 5, 6, and 7

The Energy Governance Team (EGT) is a group of relevant staff members working together to define and achieve goals of mutual interest across service teams and departments. This model has worked relatively well in fostering cross-departmental collaboration, and the county benefits from having these conversations in a formal, systematic capacity. The EGT is an effective model Ramsey County could replicate to address other key topics that bridge service teams.

The EGT has made tangible, albeit incremental, progress overseeing a strategic energy plan, developing policies to advance energy goals in departments' work, and building awareness among the Board of Commissioners. Since the EGT has already made progress driving energy efficiency, it can serve as a foundational platform to more holistically consider climate adaptation and resilience.

Ramsey County should build a strategic plan and policies to identify and mitigate climate-related risks while building capacity for residents and the organization to adapt effectively to them. Many of the teams and individuals on the EGT would also be relevant stakeholders to serve on a Resilience Governance Team (RGT). As such, it is prudent to reconstitute the EGT to meet these broader needs rather than form an entirely new committee. This will necessitate a few changes to the team's governance and operating structure:

- Expand the team's scope of work to include broader resilience issues beyond its existing energy focus. These may include, but are not limited to: evaluating options for spending environmental grant funds; incorporating a resilience component into evaluations in the Capital Improvement Program (CIP); advancing policies to promote green infrastructure on county property and development projects; developing capability to deliver county services remotely and digitally to residents (Strategic Facility Plan); and preparedness for and response to extreme weather events and natural disasters.
- Meet monthly, rather than bimonthly, to reflect the team's additional scope of responsibilities and associated workload.
- Call the Director of Emergency Management & Homeland Security (EMHS) to serve on the RGT. EMHS's mission to foster resilience in Ramsey County through the development of a communitywide culture of preparedness aligns closely to the need to build resilience across the county.
- Call the Enterprise Risk Manager to serve on the RGT. Much of the new work to be undertaken by the RGT is intended to assess and minimize risks to the county and its residents. The Enterprise Risk Manager has an important role in play in tying the RGT's work to Ramsey County's Enterprise Risk Management Plan.

Recommendation 2: Hire a Resilience Manager

Goals & Strategic Priorities Alignment: Goals 1, 2, and 3; Strategic Priorities 1, 2, 3, 4, 6, and 8
Best Management Practices Alignment: 1, 3, 5, 6, and 7

Ramsey County's efforts to build resilience are hampered by a lack of collaboration across service teams. The EGT's bi-monthly meetings fall short of the more frequent, iterative conversations needed to embed resilience into the county's work and culture. Instead, the county is reliant on ad-hoc conversations between colleagues or coordination from the Policy & Planning team, which is focused on a variety of other priorities. A dedicated resource would better advance the county's work on this front.

The Resilience Manager will be charged with:

- Raising awareness internally to the county's risks and work on climate resilience issues;
- Ensuring accountability for progress against the county's Strategic Resilience Plan (to be developed by the RGT) in partnership with the team's chair;
- Partnering with department leaders and staff to advance work against the Strategic Resilience Plan's defined goals (to be developed by the RGT);
- Identifying external grant funds for building climate resilience;
- Identifying and incorporating best practices for building climate resilience within local governments; and
- Developing and overseeing a community engagement plan.

The expectation is that the RGT maintains responsibility for creating and governing a strategic vision for resilience across the county, while the Resilience Manager facilitates implementation and drives progress against goals.

As the Resilience Manager's role is rooted in facilitating cross-service team collaboration, the Resilience Manager should be based in the Policy & Planning team. If one department houses the position, the structural silos in place could inhibit collaboration. The Resilience Manager, in working primarily with one department, may feel a natural allegiance to that department and feel compelled to put that department's needs ahead of others'. A hire should be made by the summer of 2020 so that the Resilience Manager can help shepherd the RGT's initial strategic plan development and execution. Funding could be secured by reallocating funds from natural attrition among the county's workforce.

An alternative approach would be to have the Resilience Manager work in the Department of Public Health and report to the Director of Public Health. The advantage of this approach is the Department of Public Health's culture is oriented to public engagement and outreach, and the potential external impact of the Resilience Manager's work makes public engagement an important consideration. If this approach is taken, it is important that the Resilience Manager has a dotted-line reporting relationship to the Director of Policy & Planning and/or regularly reports to the executive team. These measures will help create an expectation that other department leaders and staff collaborate with the Resilience Manager.

Recommendation 3: Build a Digitized Asset Management System that Incorporates Risk Assessment

Goals & Strategic Priorities Alignment: Goals 1 and 4; Strategic Priorities 1, 6, and 7
Best Management Practices Alignment: 4, 5, 8, 9, 10, and 11

Asset management systems provide local governments looking to upgrade their internal processes a clear first step. An updatable and accessible inventory of the county's physical assets will make subsequent procurement and investment decisions impacting county assets more streamlined and informed. Efforts are already underway to build an asset management system in Ramsey County, led by Public Works, Property Management, and Parks and Recreation. Representatives from those departments have expressed a need for creating this system, as it allows them to more easily access needed data for analysis. The county additionally has compliance requirements with Chapter 13 of the Minnesota State Statutes, which mandates how a public entity should inventory its data and make its data accessible to the public.16

This system can serve as the baseline to begin formulating an Asset Management Plan. An Asset Management Plan will provide the county with guidelines for internal adaptation and risk-mitigation planning.

For the asset management system to serve as a viable precursor to an Asset Management Plan, it should include capabilities to assess risk. Not only would the asset management system need to inventory the county's physical assets, it would also assess the condition of the asset and whether that asset (for a variety of different criteria, including extreme weather events) faces a risk of failure or underperformance. Other local governments have used a risk assessment model that follows this basic formula:

Risk = Likelihood of asset failure x Magnitude of the consequences

Examples of risk assessment matrix components include high traffic sites, sites in major disrepair, sites at a high risk for damage or destruction (such as those in areas at high risk for flooding events or collapse in extreme snowstorm), sites with high public value, etc.

The ultimate goal behind creating the asset management system and corresponding Asset Management Plan is to make climate change adaptation and proactive planning an integral part of internal operations. Thus, Ramsey County will be able to prioritize investments in its physical assets where the risks to the county and its residents are highest. To advance these long-term objectives, the Enterprise Risk Manager should be engaged on the scoping and development of Ramsey County's asset management system. Incorporating risk assessment into Ramsey County's initial asset management system will allow for a prevention strategy that will be feasible and informative to the county's broader Enterprise Risk Management (ERM) Plan.

Recommendation 4: Increase Reporting to Commissioners

Goals & Strategic Priorities Alignment: Goals 2 and 4; Strategic Priorities 1, 2, and 6
Best Management Practices Alignment: 1, 3, 7, 8, and 9

To advance more sustainable practices both internally and externally at the county, there should be more interaction with the Board of Commissioners. The Board should be updated biannually on issues of climate-related vulnerabilities and risks, serving several purposes:

- Raising the urgency of climate-related vulnerabilities, making action more likely;
- Aligning Ramsey County on a single vision for sustainability and resilience;
- Increasing transparency for residents who will be directly impacted by climate-related events;
- Increasing accountability of county staff to integrate adaptation and drive sustainability culture; and
- Positioning Ramsey County as leaders in climate adaptation and resilience planning.

The current hands-off, higher-order-thinking approach of Ramsey County's Board of Commissioners allows staff to be flexible in their work, but it also removes some accountability pressure that can drive the work. To move forward with a more integrated form of adaptation planning, the RGT should report on county initiatives and projects related to adaptation on a more frequent basis. This may take the form of workshops, briefs, and/or presentations at meetings with the Board.

Recommendation 5: Create Awareness of Climate Resilience to Attract Talent and Facilitate Culture Change

Goals & Strategic Priorities Alignment: Goals 1 and 4; Strategic Priorities 1, 2, 4, 6, and 8
Best Management Practices Alignment: 3, 8, and 9

Climate change adaptation and resilience strategy will likely involve most departments within the county in some capacity. The need for an encompassing strategy will only increase as Ramsey County continues to see the effects of climate change impact its capacity to deliver services.

As the county expects many staff retirements in the next 5-10 years, new talent can be attracted by embracing cross-departmental strategic thinking and value-driven priorities. Younger professionals seek employers who display a clear commitment to advancing the common good.[17] Ramsey County already serves the public, but taking a leadership role among counties in Minnesota in embracing cross-departmental strategic thinking and climate adaptation planning can give it a recruiting advantage. During the on-boarding process, Ramsey County should train new staff to incorporate strategic prioritization of goals and initiatives into their day-to-day work. Additionally, staff should be encouraged to advance collaboration and adaptation planning into their work and consider how their work impacts the environment and the resilience of Ramsey County. Integrating collaborative work with goal and initiative prioritization will promote a culture shift that makes Ramsey County more resilient in the future.

To create broader awareness of existing work and initiatives, county staff should be encouraged to collaborate with the Communications department to build internal (via RamseyNet or similar channels) and external (via social media, the public website, and community engagement) awareness. Encouragingly, the EGT has already identified this opportunity and is working with Communications on an awareness plan throughout 2019.

Recommendation 6: Create a Plan for Participatory Community Engagement on Climate Adaptation Work

Goals & Strategic Priorities Alignment: Goals 1, 2, 3, and 4; Strategic Priorities: 1, 2, 3, 5, and 8
Best Management Practices Alignment: 3, 5, 7, 8, and 9

It is important to design a process that is iterative and flexible to deal with the volatile and unpredictable nature of public engagement. Too often, public participation and engagement is used to meet legal requirements or as a tool to merely inform the public. Complex and politically-charged issues such as climate change and adaptation will likely require new approaches and stakeholder relationships and community buy-in. This means that Ramsey County should shift to an inclusive and collaborative approach to its participation process, which will involve the following components:

- Deliberative, consensus-based, or collaborative approaches can aid in transformative learning. Including diverse perspectives, especially with representation from those most at risk from climate change, optimizes learning. This process supports developing shared meaning via interacting and learning about each other's interests, preferences, values, and worldviews through "collaborative science."[18]
- Building social capital among participants for ongoing work by establishing connections, enhancing relationships, and fostering trust that can carry on beyond a single decision-making process into future collaboration and communication.[19,20]

Based on the principles of inclusion and collaboration, the following design should be used for the participation process (from Bryson et al., 2013):[21]

Assess and design for context and purpose

1. Assess and fit the design to the context and the problem
2. Identify purposes and design to achieve them

Enlist resources and manage the participation

3. Analyze and appropriately involve stakeholders
4. Work with stakeholders to establish the legitimacy of the process
5. Foster effective leadership
6. Seek resources for and through participation
7. Create appropriate rules and structures to guide the process
8. Use inclusive processes to engage diversity productively
9. Manage power dynamics
10. Use technologies of various kinds to achieve participation purposes

Evaluate and redesign continuously

11. Develop and use evaluation measures
12. Design and redesign

Purpose of Public Participation in Climate Adaptation Planning

To avoid inefficiencies in a public participation process, it is necessary to outline the purpose of the engagement and modify it as needed, as the purpose may change.[22] The following intentions for participation design are recommended:

Advance social justice and inclusive representation: The perspectives and participation of a broad range of community members are equitably represented in the plan.

- Improve equity in distributing public services or by increasing vulnerable populations' influence over decisions.
- Acknowledge and include stakeholders with low power and high interest.[23]

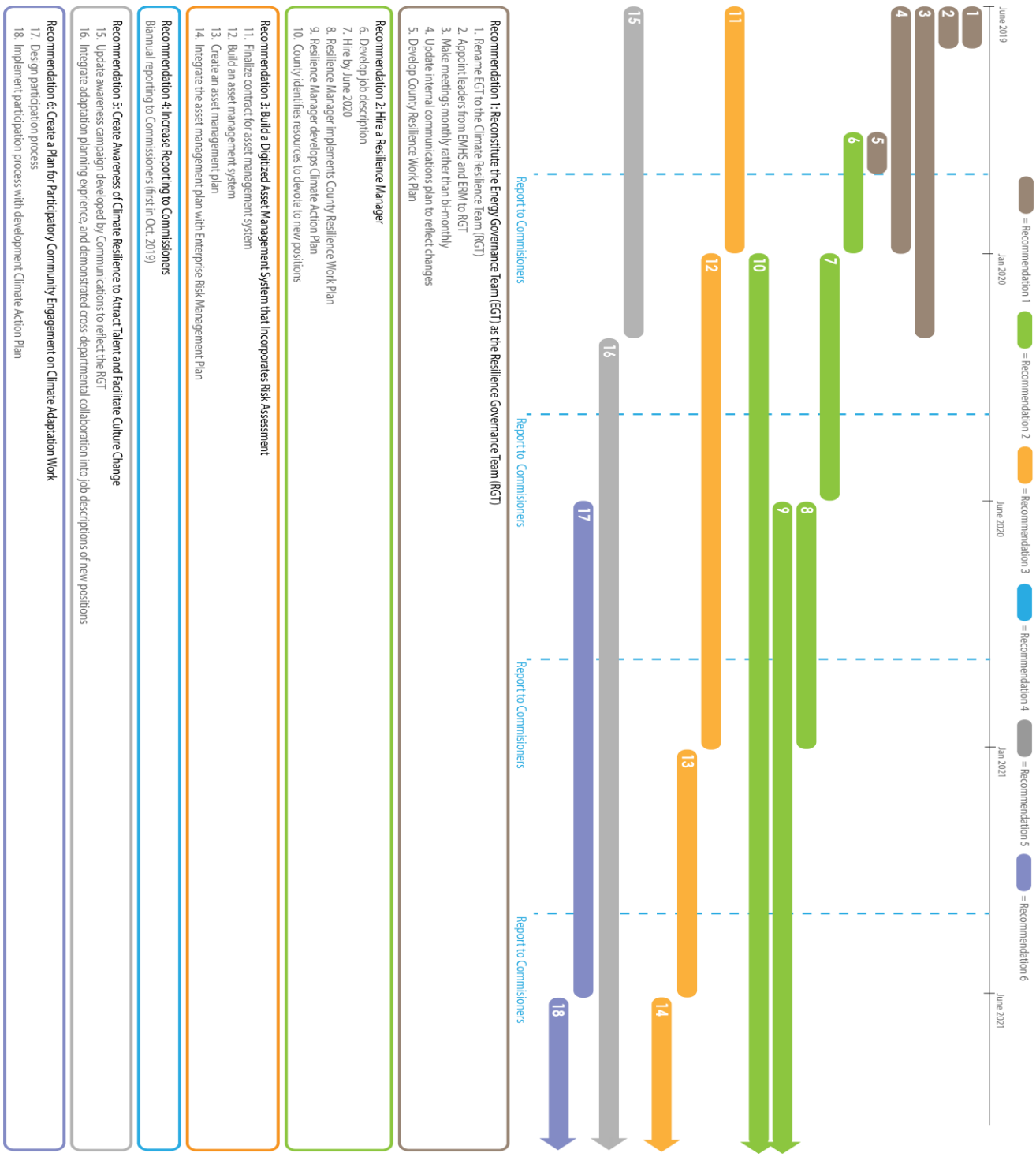
Enhance understanding of public problems: Generate potential solutions for problems proposed by the public regarding climate change adaptation.

- Design processes for sharing information and engaging and exchanging views among participants to promote understanding and discovery of new options.[24]

Generate support for decisions and their implementation: Produce decisions that address the public's needs and concerns, resolve disputes, create alliances for advocacy and implementation, and generate resources for implementation.

- Inform elected officials and decision-makers in government and elsewhere about the relationships between climate change, health, and equity.
- Avoid making decisions so that stakeholders feel left out. For example, do not make decisions narrowly or hastily or delegate decision-making to small, elite, or exclusive groups.[25]

Timeline



Recommendation 1: Reconstitute the Energy Governance Team (EGT) as the Resilience Governance Team (RGT)

1. Rename EGT to the Climate Resilience Team (RGT)
2. Appoint leaders from EMHS and ERM to RGT
3. Make meetings monthly rather than bi-monthly
4. Update internal communications plan to reflect changes
5. Develop County Resilience Work Plan

Recommendation 2: Hire a Resilience Manager

6. Develop job description
7. Hire by June 2020
8. Resilience Manager implements County Resilience Work Plan
9. Resilience Manager develops Climate Action Plan
10. County identifies resources to devote to new positions

Recommendation 3: Build a Digitized Asset Management System that Incorporates Risk Assessment

11. Finalize contract for asset management system
12. Build an asset management system
13. Create an asset management plan
14. Integrate the asset management plan with Enterprise Risk Management Plan

Recommendation 4: Increase Reporting to Commissioners

Biannual reporting to Commissioners (first in Oct. 2019)

Recommendation 5: Create Awareness of Climate Resilience to Attract Talent and Facilitate Culture Change

15. Update awareness campaign developed by Communications to reflect the RGT
16. Integrate adaptation planning experience, and demonstrated cross-departmental collaboration into job descriptions of new positions

Recommendation 6: Create a Plan for Participatory Community Engagement on Climate Adaptation Work

17. Design participation process
18. Implement participation process with development Climate Action Plan

APPENDIX

APPENDIX 1: State of Minnesota Climate Change Resilience Efforts

The State of Minnesota recognized the ongoing effects of climate change and in 2009 formed the Interagency Climate Adaptation Team (ICAT). This team, headed by the Minnesota Pollution Control Agency (MPCA), spans many state agencies that collaborate on climate adaptation issues. While the state has not formally adopted a climate adaptation plan, it is considering climate impacts across a range of programs and initiatives.

In its 2017 report, Adapting to Climate Change in Minnesota, ICAT recognized that the state of Minnesota is concerned about the impacts of a changing climate on natural resources, economy, health, and quality of life and is taking action to address these emerging challenges.[26] The state separated its climate change work into two areas: mitigation and adaptation, dealing mostly with adaptation. Its 2017 report focused on defining and implementing strategies, initiatives, and measures to help human and natural systems prepare for and address climate change impacts to create a more resilient state.[27]

The report lists efforts in different state departments to combat climate change effects and ends with recommendations for the future. The following are relevant to Ramsey County:

- Increase focus on managing climate impacts in cities, towns, and other population centers.
  - Develop tools that individual communities at the county or city level can use to better increase the resilience of their vulnerable populations.
- Identify opportunities to strengthen the climate resilience and health of vulnerable populations of Minnesotans across state agency programs and through cooperation with local governments.[28]

ICAT strongly recommended the state develop and adopt a climate adaptation plan by the year 2020.[29] It is unclear that the state will reach this goal.

APPENDIX 2: Metropolitan Council Climate Change Resilience Efforts

The Metropolitan Council (Met Council), the regional planning and governmental agency of which Ramsey County is a part, adopted its 2040 Comprehensive Plan, Thrive 2040, in 2014. The plan sets the vision and policy foundations for the seven-county metropolitan area for the next 30 years. In Thrive 2040, the Met Council outlined several goals for the region related to equity, sustainability, and resilience.

The Met Council recognizes that climate change impacts will be one of the greatest threats to the region's prosperity and livability over the long term and that climate change will continue to threaten infrastructure and economic development.[30] Thrive 2040 outlines that to respond to these effects, the region will need to take a three-pronged approach: mitigation, adaptation, and resilience. It defines adaptation strategies as those that will focus on how to change policies and practices to adjust to the effects of climate change.

The Met Council will use climate impacts as a lens through which to examine all of its work. It will also look for opportunities to use its operational and planning authorities to plan for and respond to the effects of climate change. The Met Council will collaborate with regional leadership and convene local governments and the broader community to address climate change mitigation and adaptation within the region. These expanded roles in information and technical assistance will help the Met Council serve as a resource to local jurisdictions and the region at large. The Met Council intends to be a prominent player in elevating this issue, which affects the long-term viability of the Minneapolis-Saint Paul region.[31]

To lay a foundation for collaboration, the Met Council outlines the following climate adaptation planning goals for the region:

> *"Providing leadership, information, and technical assistance to support local governments' consideration of climate change mitigation, adaptation, and resilience."*[32]
>
> *"Expand the information and technical assistance it provides to local governments to support regional and local climate change planning."*
>
> *"Provide technical assistance to the region's local governments, including identifying risks, best practices, and model ordinances for climate change mitigation and adaptation, and working in partnership with the Minnesota GreenStep Cities program."*

These goals set a precedent for the region to proliferate climate change adaptation goals and encourage counties and municipalities in the region, including Ramsey County, to take action.

APPENDIX 3: Ramsey County Goals and Strategic Priorities

Ramsey County Goals

1. **Strengthen individual, family and community health, safety and well-being** through effective safety-net services, innovative programming, prevention and early intervention and environmental stewardship.
2. **Cultivate economic prosperity and invest in neighborhoods with concentrated financial poverty** through proactive leadership and inclusive initiatives that engage all communities in decisions about our future.
3. **Enhance access to opportunity and mobility for all residents and businesses** through connections to education, employment and economic development throughout our region.
4. **Model fiscal accountability, transparency and strategic investments** through professional operations and financial management.

Ramsey County 2019 Strategic Priorities

1. Residents First: Effective, Efficient and Accessible Operations
2. Advancing Racial and Health Equity in All Decision-Making
3. Inclusive, Effective and Meaningful Community Engagement
4. Integrated Approach to Health, Wellness and Justice
5. Advancing a Holistic Approach to Strengthen Youth and Families
6. Comprehensive Economic Development to Build Prosperity
7. Stability Starts with a Place to Call Home
8. Talent Attraction, Retention and Promotion

Appendix 4: Risk Assessment

Risk assessment is a science-based tool used to estimate risks and ultimately help government agencies and the public make informed decisions about preventing and reducing risks.[33] In Minnesota, the Minnesota Department of Health (MDH) uses its Health Risk Assessment Unit to protect public health by evaluating and communicating information about health risks from exposure to environmental health hazards.

In 2014, MDH conducted a statewide climate change vulnerability assessment to assess population vulnerabilities by county based on retrospective data for the following climate hazards: extreme heat events, air pollution, vector-borne diseases, flooding and flash flooding, and drought.[34] This assessment was an initial attempt at quantifying climate change vulnerability in Minnesota with the intention of local governments conducting additional, more granular, assessments. Using MDH's approach as a framework, Saint Paul-Ramsey County Public Health conducted its own Climate Change Vulnerability Assessment, focusing on factors specifically pertinent to Ramsey County.

Further use of GIS can map vulnerability and environmental risk factors, allowing an assessment of the overall impact of each climate hazard and identify the most risk-prone areas. Economic modeling can also be used to estimate the magnitude of risks based on historical data and future projections.

Appendix 5: Asset Management Planning

Some local governments have created asset management plans to assess and mitigate future risks to physical infrastructure. These plans are designed to systematically evaluate the condition of the government's existing assets, the likelihood of asset failure, and expected consequences if the asset failed. This analysis allows governments to prioritize investments to minimize the risks of asset failure, the financial ramifications to the government, and the impact on residents who depend on those assets performing well.

The City of San Diego, for example, created a Water Asset Management Plan to document its current state of assets and project the long-range asset renewal requirements for the city's Stormwater Division. The plan required subdivisions to identify the assets they own and manage, provide an understanding of critical assets required to deliver the services, record the strategies that will be used to manage the assets, and document the future investments required to deliver services. These plans are now used to identify and prioritize potential water quality and flood risk management challenges and to evaluate opportunities for integrating water quality and flood risk management into city projects, operations, and maintenance.[35]

A visual example of a risk assessment scenario matrix is shown below:

	CONSEQUENCE				
	Negligible	Minor	Moderate	Major	Catastrophic
LIKELIHOOD	1	2	3	4	5
Almost certain (A)	Medium	Medium	High	High	Very High
Likely (B)	Low	Medium	Medium	High	Very High
Possible (C)	Low	Low	Medium	High	High
Unlikely (D)	Low	Low	Medium	Medium	High
Rare (E)	Low	Low	Low	Medium	Medium

Source: Local Government Climate Change Adaptation Toolkit: Cities for Climate Protection Australia Adaptation Initiative

APPENDIX 6: Alameda County, CA

County Overview

Alameda County is located in the "East Bay" region of the San Francisco Metropolitan Statistical Area. It occupies 821 sq. miles and has a population of 1.6 million.[36] Alameda County is the fourth most racially diverse county in the United States.[37] The median household income is more than $85,000.[38] The county has a temperate climate year round, with an average high temperature of 75 degrees in the summer and an average low of 42 degrees in the winter.[39] The county has an annual precipitation of 21.3 inches.[40]

Alameda County is governed by five elected officials on its Board of Supervisors. With an operational budget of $3.42 billion for the 2019 fiscal year, Alameda County government provides infrastructure, emergency services (law enforcement, fire), flood control, libraries, and other services to the unincorporated areas of the county. It also provides an array of services to all county residents including foster care, public health, jails, elections, property assessment, tax collection, vital statistics, and legal services. The County government employs approximately 9,000 people and operates more than 150 buildings and facilities.[41]

County Climate and Sustainability Initiatives

Alameda County Climate Action Plan for Government Services and Operations

Alameda County has a Climate Action Plan, which was passed in 2010 and is implemented by its Climate Action Team.

Climate Action Team

This team is divided into the Climate Executive Committee and a staff level working group and is comprised of representatives from the Auditor-Controller, Community Development, General Services, Health Care Services, Human Resources Services, Information Technology, Public Works, Social Services, and the Sheriff's Office. The Executive Committee, headed by the County Administrator Susan S. Muranishi, leads the implementation of the county's Action Plan.[42]

Designing the Plan

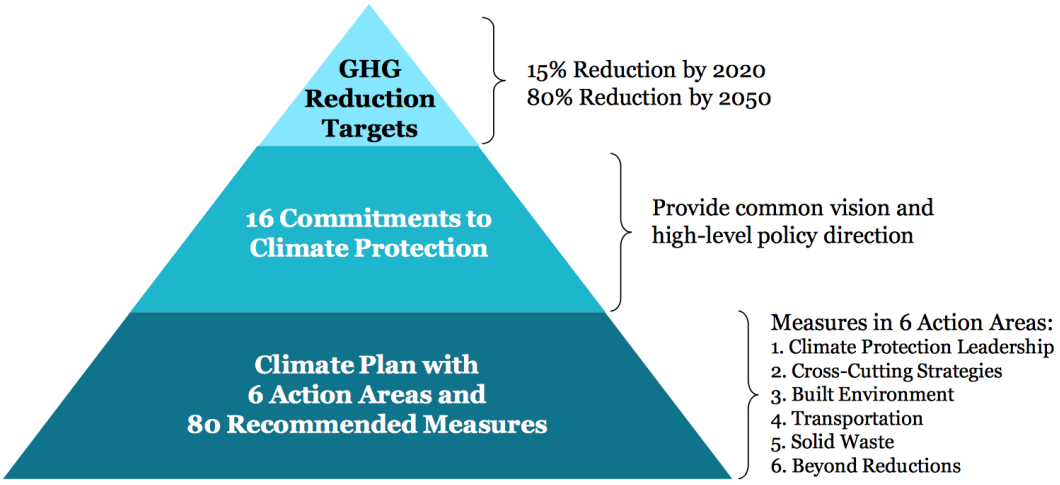
Given the Climate Action Plan for Government Services and Operations process was started in the aftermath of the Great Recession, staff tasked with developing the plan knew that any plan they produced needed to be fiscally restrained and have the buy-in of the county agency heads and employees who would be responsible for implementation. To achieve this, a cross-agency process was developed to engage county employees and decision-makers in creating the plan.[43]

With support from the County Administrator and other key agency heads, the first steps were to designate Agency Climate Coordinators (ACCs) in every agency and set up a climate protection intranet site where employees were invited to submit their ideas. More than 500 ideas were submitted. Through the course of the plan's development, the ACCs were individually interviewed at their offices and met five times as a group. The process provided invaluable input that was used to customize the measures that were included in the Climate Action Plan and to develop an implementation approach that would be acceptable to the diverse array of agencies across the county government.

In addition to the GHG emissions reductions that the plan will achieve, measures were given priority based on their ability to achieve other environmental or social benefits, be implemented cost effectively within individual agencies, and advance existing county policies and goals. Alameda County dedicated considerable staff time to developing the plan, which was funded in part through a grant from the Bay Area Air Quality Management District. The Board of Supervisors adopted the plan and climate action framework unanimously and with high praise in May 2010.[44]

Final Recommendations

FIGURE 1: CLIMATE ACTION FRAMEWORK FOR GOVERNMENT SERVICES AND OPERATIONS



Source: Alameda County Climate Action Plan

The recommended measures by the ACCs were reduced to a list of 80 and then analyzed for potential costs and benefits. This analysis was based on county-specific data, when available, and the experiences of other jurisdictions and generally-accepted methods for quantifying GHG impacts.

Each measure was then ranked into three tiers. The measures were ranked in each of the six action areas, reflecting the need for agencies and departments to implement projects in each action area simultaneously. This prioritization indicated where the county should first direct its efforts, resources, and focus. The prioritization took into consideration the anticipated:

- GHG reductions and other benefits;
- Potential financial savings and monetary and staff resources required for implementation; and
- Practicality for implementation, defined as a measure's importance in laying a foundation for other actions, how it fits with existing priorities, and its ease of implementation.[45]

Implementation

The structure of the plan and implementation strategies were a balance between a top-down approach to maximize greenhouse gas (GHG) reductions by rolling out actions countywide and a grassroots approach to provide agencies the flexibility to choose when and how to implement each action. Certain measures were rolled out countywide so that the county benefits from collaboration and economies of scale to create consistent policies and programs across

its operations. At the same time, agencies received the tools, information, and models needed to roll out additional measures of their choice and address agency-specific needs.[46]

All of the actions recommended in the Climate Action Plan are intended to be implemented over ten years to put the county on a path towards meeting its short- and long-term emissions reduction goals. However, some measures may require additional financial resources, further research and analysis, and the involvement of multiple departments and employee organizations.

Other actions may surface that achieve similar outcomes. Although the recommended measures are considered sound steps to reduce emissions, implementing additional actions is encouraged when it makes sense. The Climate Action Plan will be reviewed and updated periodically as new information and technologies emerge and the needs and characteristics of Alameda County change.[47]

APPENDIX 7: Fairfax County, VA

County Overview

Fairfax County is located in the Commonwealth of Virginia and is predominantly suburban, forming part of the inner suburban ring of Washington DC. The county is just over 400 sq. miles and is mostly land, only approximately 4% of the county is water. Some areas of the county are near sea level.[48] As of 2018, the county had a population of 1.1 million. The county's most recent annual budget was $7.97 billion.[49]

Employment levels in the county are very high, with only 3.4% unemployment. The majority of households in the county have an income between $50,000 and $124,000 but there are almost 94,000 households in the county that earn more than $200,000. More than 90% of the adults have at least some college education or a higher degree, making the county a highly educated area to live in.[50] 38% of the population speaks a language other than English at home.[51]

The county is an expensive place to live. Nearly $64,000 in annual income is needed to rent an average market rate one-bedroom apartment while $519,560 is the median market value of owned housing.[52]

Fairfax County is governed by a nine-member Board of Supervisors elected by district with an additional chairperson elected at-large. The board appoints a single county executive that oversees the administrative operations of the county and reports to the board.[53] The board is responsible for establishing policy, approving resolutions and ordinances, approving various land uses, and making citizen appointments to various committees within the county. Board members are also often active participants on committees and other initiatives in the D.C. metro area.[54]

The county has more than 70 separate boards, authorities and commissions (BAC) that advise and inform the board. These BACs are responsible for things ranging from police oversight and conduct review to award selection committees.[55] In addition, the Fairfax County Water Authority, the Northern Virginia Regional Commission, the Northern Virginia Regional Park Authority, and the Upper Occoquan Service Authority have regional environmental responsibilities.

County Climate and Sustainability Initiatives

Fairfax County's Board of Supervisors has long recognized the county's essential role in fostering sustainability. In 2004, the board adopted an environmental vision, which was subsequently revised in 2007 and 2017 based on extensive input from the community. The vision was divided into seven key areas:

Land Use	The board's Strategic Plan to Facilitate Economic Success emphasizes the need for mixed-use, livable, and walkable activity centers. It encourages redevelopment of older areas and using low impact design (LID) standards for future developments. These goals are compatible with environmental preservation and restoration practices and support environmentally-minded practices.[56]
Transportation	The transportation vision of Fairfax County seeks a connected network efficiently designed and run. The intent of this vision is to reduce the number of trips and the resulting congestion. One challenge with the transportation vision is that much of the Washington, D.C. area's

	transportation planning is dictated by air quality planning. Still, the county aims to promote smart and reliable development through transportation.[57]
Water	With few water bodies, Fairfax County places a high value on the water that it has. Its goals are to protect and restore natural water bodies, promote conservation, and ensure effective stormwater management, water treatment, and reliable drinking water supplies to the county's residents. The county seeks to implement the best available technology and practices through policies, regulations, and outreach.[58]
Waste Management	Fairfax County encourages waste reuse, diversion, and recycling. It sees this component of the vision as a need to reduce waste and utilize reuse practices that have positive environmental outcomes. One proposed example is to capture and use methane produced at landfills rather than purchase natural gas.[59]
Parks & Ecological Resources	Almost 20% of Fairfax County's' open space is owned by the government or partner organizations and is used by more than 87% of households. The board sees the green space habitat and ecological resources as a benefit to residents' physical and mental health. The board's vision prioritizes deliberate inventory, planning, maintenance, enhancement, and restoration to ensure an efficient, resilient, and effective natural ecosystem.[60]
Climate & Energy	Fairfax County has been a longtime leader in addressing issues related to climate change and driving efficiency. The board envisions a greater emphasis on alternative energy sources. It specifically sees the need to engage residents, local businesses, and employees in contributing to reduction and conservation efforts.[61] Fairfax County was a founding member of Cool Counties, which is described below. By 2015, Fairfax County had reduced its GHG emissions per capita 20% from 2005 levels.[62]
Environmental Stewardship	The key component of environmental stewardship for Fairfax County is the partnership with residents and businesses. The vision for environmental stewardship is continued coordination and education and outreach programs that encourage personal environmental stewardship. While recognizing residents should be environmental stewards, the county must lead these efforts and be an example.[63]

2019 Sustainability Initiatives Report

In addition to the board's environmental vision, Fairfax County produces an annual initiative report, which provides an overview of current and past efforts and a strategic plan for the future. Much of the work that has been done is the result of direction from the Board of Supervisors. Some key steps taken by the county include:

Internal Collaboration and Coordination

The Environmental Coordinating Committee (ECC) and the Energy Efficiency and Conservation Coordinating Committee (EECCC) represent Fairfax County's Energy Core Team. These committees consist of inter-agency management staff and facilitate conversations and work across the different county departments. The Energy Core Team is instrumental in developing policy and practice related to the environment and energy efficiency. This team acts together with the Environmental Quality Advisory Board (EQAC), which is a board-appointed committee that.

Like the Energy Core Team, EQAC develops policy, but EQAC is also a forum for citizens to come to regarding environmental issues.

Cool Counties Climate Stabilization Initiative

In 2007, Fairfax County was a founding member of Cool Counties. Cool Counties consists of counties from across the country that pledge to inventory their operational greenhouse gas emissions, work at the local, regional, and national scale to reduce regional emissions 80% from 2005 levels by 2050, and urge federal action through market-based methods to reduce greenhouse gas emissions, specifically targeting a minimum 35 mpg standard for cars and light trucks.[64] Each county participating made declarations based on its respective circumstances, including Fairfax County. The initiative committed the counties to create an inventory of their own operational greenhouse gas emissions and then work on a regional scale to reduce emissions.

APPENDIX 8: Hennepin County, MN

Similar to Ramsey County, Hennepin County has a diverse array of green and sustainability initiatives, but it has not coordinated them into a single countywide plan. Two noteworthy initiatives Hennepin County has initiated are:

Hennepin County Sustainable Development Strategy - The Hennepin County Sustainable Development Strategy (HCSDS) was developed and is implemented by the county's Housing, Community Works, and Transit Department (HCWT). HCWT is a principal implementation agency of county programs and brings together financial resources, staff, and partners to achieve sustainable development results. The focus of this plan is to align resources to integrate multi-modal transportation, economic development, housing, and community choices.[65] To support this strategy, HCWT seeks collaborations and investments that are responsive to the county's diverse communities and yield multiple, intertwined benefits. The plan explicitly recognizes that the county's rural, suburban, and urban areas have different priorities, and their success depends on each other's vitality.[66] HCWT uses this strategy to target limited resources and guide policymakers, partners, and staff to collaboratively develop sustainable communities. The plan focuses on four main areas:

1. *Improving Transportation Options* - The HCSDS "aims to support multi-modal (pedestrian, bike, transit, vehicle, and freight) transportation corridors to create sustainable, healthy communities for people who live in, work in, or visit the county." It recognizes "multi-modal as an equitable approach which offers a variety of transportation options for people of all means and abilities to get where they want to go in a safe and timely manner."[67]
2. *Enhancing Economic Development and Competitiveness* - The HCSDS "aims to support existing and emerging employment centers, emphasizing business development and expansion and job creation through access to capital and workforce development." It recognizes "that easy access to employees, customers, and suppliers strengthens economic competitiveness and development."[68]
3. *Providing Equitable and Affordable Housing* - It aims "to create a range of safe, mixed-income housing units that meet residents' needs and have access to employment sites, transit corridors, and other key destinations."[69]
4. *Valuing and Supporting Existing Communities* - Through its sustainable development approach, HCWT recognizes "the important role that transportation system connectivity plays in improving communities. Transportation means more than roads, mobility, and safety – it supports and strengthens communities. HCWT works in partnership with local governments and stakeholders to enhance the quality of life, economic vitality, and private investment in communities. Through program tools, such as transit-oriented development assistance, affordable housing incentives, workforce development, and other forms of assistance, the department supports communities in their development and redevelopment efforts."[70]

Cool County Initiative: Like Fairfax County, Hennepin County was a founding member of a coalition of counties across the U.S. that took action to reduce greenhouse gas emissions. The Board of Commissioners adopted goals to reduce greenhouse gas emissions by 15% by 2015, 25% by 2025, and 80% by 2050 from 2005 levels.[71] The initiative relies on reducing energy use and using more renewable energy. The effort also includes green building design, more efficient vehicle fleet management and transportation practices, and other targeted greenhouse gas emission reduction programs.

Hennepin County met its 2015 goals largely due to its implementation of GHG reduction strategies in its own buildings.[72] Many factors contributed to the county's success. Xcel Energy's increased use of renewable energy was

one important factor. The county also implemented energy conservation and efficiency measures to reduce energy consumption. Although the county manages more building space than it did ten years ago, total energy consumed in county-owned facilities has decreased.[73]

APPENDIX 9: King County, WA

County Overview

King County is bordered by Puget Sound on the west and the Okanogan-Wenatchee National Forest on the east and includes the City of Seattle. The county is 2,307 sq. miles with its lowest point at sea level and its highest being Mount Daniel at nearly 8,000 feet.[74] King County's population is nearly 2.2 million, approximately two-thirds of which live in the Seattle suburbs.[75]

Like Ramsey County, King County is directed by a nine-member council elected from districts of approximately 240,000 residents each. The council has multiple standing committees to oversee specific governmental functions.[76] King County is supervised by a county executive who appoints an executive leadership team to oversee various target areas of county operations. The County Executive's role is chiefly to act as a liaison between the council and county staff. The current county executive and council are committed to addressing issues of equity and the environment.[77]

2015 Strategic Climate Action Plan (SCAP)

King County recognizes that impacts from climate change are already occurring and will continue to occur in the future, even if greenhouse gas emissions are drastically cut. Therefore, the 2015 SCAP outlined strategies to integrate climate change preparedness into the county's operations and maintenance of infrastructure, programs, and natural resources, provision of public services, and partnerships with local governments, community groups, and businesses.[78]

The SCAP is divided into two sections, with the first focused specifically on reducing greenhouse gas emissions. Areas of focus for reduction include transportation and land use, building and facility energy, green buildings, consumptions and materials management, and forests and agriculture.

The second section of the SCAP is structured around preparing for climate change impacts. In this section, the county identifies the specific impacts of climate change to county services and operations. The county divides program-specific services areas into two sections with 12 focus areas:

Built Environment:

1. Wastewater Treatment and Conveyance
2. Roads and Bridges in Unincorporated King County
3. King County International Airport
4. King County-Owned Buildings and Facilities

Planning and Regional Services:

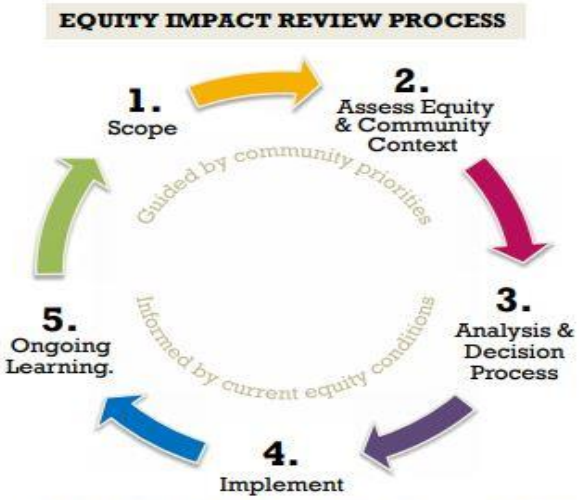
5. Countywide and Regional Planning
6. Public Health
7. Stormwater
8. Flood Risk Reduction and Floodplain Management
9. Salmon Recovery and Other Rural Programs
10. Public Transportation (including King County Metro Transit and Water Taxi)
11. Environmental Science and Monitoring
12. Emergency Management

These program-specific areas indicate the county's ongoing priority actions within each focus area and the long-term direction the county will take. These summaries prepared the county to determine a list of 15 priority actions to be accomplished by 2020 with focuses on science and research, planning and implementation, and partnerships.

Within the SCAP, the Office of Emergency Management identified three specific actions that the county would take to respond to emergency situations over the coming five years. The first of these was creating an annual report that compiles the status of mitigation action strategies. The office works with each planning partner to assess the status of the strategy to better inform emergency planning. Second, the department will integrate the findings from its assessments into ongoing public education presentations and campaigns. Finally, as the Office of Emergency Management now includes scenarios such as heat waves and other climate-related emergency situations into its portfolio of training.[79]

King County's Equity and Social Justice Ordinance required the use of the Equity Review Process (see right) when developing the SCAP. However, the county recognized that "climate change will have disproportionate impacts on some communities, including low income populations and those with existing health issues."[80]

In February 2019, King County provided an implementation plan for becoming carbon neutral. This plan builds off of the 2015 SCAP and the county's 2016 Comprehensive Plan.[81] The SCAP provided an initial action related to climate change and has since been built on by King County in an accountable and realistic framework.



Source: King County 2015 Equity Impact Review Process Overview

The Equity and Social Justice Plan (ESJP)

Beginning in 2008, King County took a more strategic and coordinated approach to addressing social, economic, and environmental disparities. Prior to 2008, departments across the county individually addressed inequality. The ESJP championed by the then County Executive Ron Sims made this a shared priority across the county.

The plan is divided into six goal areas: Leadership, Operations, & Services, Plans, Policies, & Budgets, Workplace & Workforce, Community Partnerships, Communication & Education, and Facility & System Improvements. Within each goal area there is a subset of goals that must meet minimum standards and SMART objectives (specific, measurable, achievable, relevant, and time-bound). For example, within the Leadership, Operations, & Services goal area, a sub-goal is to develop effective and accountable leadership to drive pro-equity governance at all levels of the county. To accomplish this, one objective that was created using the SMART guidance is to incorporate ESJP measures into all managers', supervisors', and directors' performance appraisals and professional development plans. This type of approach creates an environment of accountability where issues will be tangibly addressed.[82]

APPENDIX 10: Miami-Dade County, FL

County Overview

Miami-Dade County is located along the southeast tip of Florida, encompassing more than 2,000 sq. miles with a third of the county located in the Everglades National Park. There are 34 separate municipalities and more than 2.7 million residents, more than 1 million of which live in unincorporated areas.[83] More than half of the population is foreign-born.[84] The average per capita income is less than $42,000.[85] Miami-Dade County has a 2019 budget of $7.9 billion.

The county has an average annual high temperature of 84 degrees while winter temperature highs are often around 70 degrees, making temperature swings in the county minimal. Average humidity ranges from 84% in the morning to 63% in the evening. The county averages 58 inches of precipitation per year. Miami-Dade County, and Florida as a whole, are highly susceptible to hurricanes with 40% of hurricanes on the east coast of the U.S. hitting Florida.[86] Miami-Dade County site at an average of only 12 feet above sea level, and the county has begun to see the impacts of sea level intrusion impacting drinking water supplies due to porous ground conditions.

The Miami-Dade Board of County Commissioners is comprised of 13 members that represent the various districts of the county. The County Commission serves as the overall governing body and has the regional powers to establish policies for the services it provides. In addition to the County Commissioners, Miami-Dade has a mayor that can veto Commission actions. The mayor also has the authority to oversee the county's day to day operations.[87]

Miami-Dade County's services are spread across 30 different departments. These departments range from typical services such as auditing, elections, and information technology to specialty departments such as aviation (Miami International Airport), the Vizcaya Trust (Vizcaya Museum and Gardens), and PortMiami (cargo and passenger seaport).[88]

County Climate and Sustainability Initiatives

Miami-Dade County's Office of Resilience is responsible for implementing the county's Sustainability Plan, GreenPrint. This plan frames how the county and community will achieve future resilience through a multi-pronged approach of economy, urban environments, mobility, and environmental stewardship. The Office of Resilience is also responsible for taking the lead role in the Resilient Greater Miami and the Beaches (GM&B), which is a component of the 100 Resilient Cities Program.[89]

Southeast Florida Regional Climate Change Compact[90]

The Southeast Florida Regional Climate Change Compact is comprised of the counties of Miami-Dade, Monroe, Palm Beach, and other partners and municipalities. The Compact is designed to coordinate actions for parts of Florida that face similar issues as the climate changes, such as sea level rise.[91]

GreenPrint: Design for a Sustainable Future[92]

In 2009, Miami-Dade County was selected as one of three pilot communities for a sustainability planning toolkit pilot through ICLEI-Local Governments for Sustainability. The pilot program offered the opportunity for Miami-Dade to develop a plan to incorporate past practices, plan for the future, and work in tandem with other counties and municipalities. The resulting document is known as GreenPrint and is a framework for the future of the county and surrounding area. The plan has seven main focus areas:

1. *Strong Connections, Leadership, & Commitment* - Miami-Dade identified leadership as an essential component to sustainability initiatives. This section of the plan identifies strengths and areas of opportunities for the county to create the next generation of green leaders. The key strategies to accomplish its goals include: strengthen regional and local community partnerships, integrate sustainability into all leadership systems, be green governmental role models, and create ongoing outreach, education, and dialogue with the community.[93]
2. *Water & Energy Efficiency* - Miami-Dade County seeks to reduce the consumption of water and energy through efficiency and conservation efforts. Strategies to accomplish this are to reduce to improve energy planning through partnerships, continue the ongoing water and energy efficiency and conservation campaigns, expand alternative fuel and energy options, and for the government to be leaders in energy, fuel, and water efficiency.[94]
3. *Our Environment* - This section of the plan focuses on the natural environment in Miami-Dade County. The initiatives outlined include implementing wastewater reuse for future water supplies, addressing salt intrusion that threatens natural areas and drinking supplies, protecting and enhancing existing natural resources, protecting areas that are important for resilience, and developing a solid waste system and master plan that uses waste to benefit the economy.[95]
4. *Responsible Land Use & Smart Transportation* - As noted previously, Miami-Dade County sits in a precarious location due to its low elevation and proximity to the ocean. The county's GreenPrint Plan takes this vulnerability into consideration and ties it to the need to use land wisely. The priorities in this section focus on connecting all parts of the county efficiently and economically. Initiatives include better integration of planning and prioritized investments, supporting existing development and neighborhoods that may have been poorly served in the past, increasing biking and walking, increasing transit ridership, and improving existing connectivity and mobility systems. The plan included in this section notes the county's population areas and focuses efforts on areas with the greatest need.[96]
5. *Vibrant Economy* - This portion of the plan is focused on integrating practices into economic development strategies. In Miami-Dade County, a green economy takes into consideration the social, economic, and environmental factors that ultimately make its operation sustainable. To create this vibrant sustainable economy, Miami-Dade County seeks to promote green business, expand the already successful tourism and trade components of its economy, support the educational institutions that are developing a workforce to succeed in a sustainable economy, and increase sustainable agriculture practices.[97]
6. *Healthy Communities* - The overall intent of this section of the plan is to encourage residents to be more active, which serves the dual purpose of being environmentally friendly and promoting healthy lifestyles. The county's efforts to increase biking and walking have expanded over time, and the GreenPrint Plan further advances the county's efforts. These initiatives include facilitating active and safe lifestyles through a separate Open Space Master Plan, planting more trees and diversifying the environment, promoting fresh and locally grown foods, and supporting efforts to create community gardens and farmers markets.[98]
7. *Climate Change Action Plan* - Florida is one of the most vulnerable states to climate change in the U.S., with Miami-Dade County especially susceptible to sea level rise and hurricanes. Some of the greatest concerns for the county include erosion, salt water intrusion, extreme weather events, and flooding. The county has robust initiatives in place to mitigate and adapt to as many of those impacts as possible. The initiatives include tracking local and regional trends, identifying indicators, developing "worse-case" scenarios to prepare for these events, and integrating future impacts into community and governmental decision-making processes for capital, operational, and land use impacts. The second component of the climate change action plan is an effort to reduce emissions. The Climate Change Action component of the plan further

breaks down emission reduction efforts in the Water & Energy Efficiency and Responsible Land Use & Smart Transportation sections of the GreenPrint Plan.[99]

Lastly, GreenPrint includes an implementation structure and timeline. Each section of the plan is broken down into subsets of goals and strategies and identifies leaders, partnerships, and funding needed. It quantifies impacts where possible, such as emissions reductions. This provides a clear path for the county's work and drives action within the county. It also aids county staff in guiding their work and embeds sustainable decision-making and best practices within the county's culture and work.

APPENDIX 11: City of Duluth, MN: 2012 Flood Recovery Efforts

City Overview

The City of Duluth is located in northeast Minnesota, at the westernmost tip of Lake Superior. The city has around 87,000 residents, the vast majority of which are white (88%) and speak English (95%).[100] More than a third (38%) of households make less than $35,000 per year, and more than half of households make less than Minnesota's median annual income of around $65,000.[101] Because of its position on Lake Superior, Duluth is a major shipping hub for the Great Lakes region. It also has a healthy tourism industry.

Duluth has a notable topography, with a steep hillside leading down to the lake. The city is 26 miles long and its terrain has a dramatic 880-foot rise above sea level. Lake Superior, as a major adjacent water body, moderates the city's weather patterns. Winters tend to be warmer than the rest of the state, summers cooler, and fog or cloudy days often shroud the city in gray.[102] The city typically sees an annual snowfall of 80 inches, and an annual rainfall of about 31 inches.[103] The steep topographical decline into a mid-sized urban center with a high rate of impermeable surfaces makes the city susceptible to flood events.

2012 Flood

In June 2012, Duluth saw one of the worst flood events in its history. Characterized as a "500 year flood," the flash flood overswelled already saturated surfaces to inundate the city with about ten inches of water over two days.[104] Even three years after the flood, wash outs and hillside damage kept a major state highway closed.[105]

The flood caused an estimated $47 million dollars in damage and repair costs. The flooding caused major destruction to roads, culverts, personal property, and other man-made infrastructure and decimated stream beds integral to stormwater management. Though Duluth city proper bore the brunt of the disaster, the entirety of the surrounding area, St. Louis County, also saw damage to the county highway system estimated at $50 million.[106]

Flood Response Efforts

The city obtained Federal Emergency Management Agency (FEMA) funding for its damaged physical infrastructure. The funding and increased attention paid to the natural disaster gave Duluth an opportunity to upgrade its stormwater capacity to accommodate increased rainfall. It also offered the chance to protect fish habitat, which benefits the angling industry and local ecology.[107] Officials took the opportunity to survey and upgrade the stormwater sewer system, which had been installed at the turn of the 20th century, to bring it up to standards and capacity of Atlas 14 rainfall data. Atlas 14 precipitation frequency data is a historical register of rainfall events compiled National Oceanic and Atmospheric Administration (NOAA) for Midwestern states to plan for stormwater infrastructure.[108] The stormwater manager in the city's Public Works department took on a project management role to create a plan to manage and fix the damage.

Duluth could not cover the cost of repairing streams and underground stormwater tunnels entirely with federal dollars. Therefore, the city lobbied for funding from state agencies such as the Department of Natural Resources. All told, the city received nearly 60% of its flood recovery funds from the state (either earmarked for flood relief or other grants), with most of the remaining funds coming from federal disaster relief. Public Works then designed a risk management matrix to designate which of a long list of projects it would prioritize and in what order. Duluth's stormwater manager, who managed the recovery projects, said that its matrix included considerations such as the threat to life and safety, the threat to nearby infrastructure, public visibility, and whether the project already had designated federal funding.[109]

Once projects were ranked, the city developed cross-departmental and cross-governmental collaborative task forces on a site-by-site basis.

Efforts to upgrade the stormwater sewers continue today, in part because of the complex easements needed to unearth sewers underneath private land and the complicated task of digging up and widening underground tunnels in the middle of a city. All told, Duluth has about 435 miles of stormwater sewers, some of which have not been upgraded since they were built.

After undergoing this major recovery effort, Chris Kleist, the project manager for stormwater systems, identified a few takeaways to increase flood adaptation capacity. First, he said that new development and construction projects should consider incorporating more aggressive stormwater controls, and that the new construction would provide additional stormwater discharge capacity. Kleist said that Public Works should incorporate as much ongoing maintenance of stormwater systems as possible to ensure optimal functionality. In other words, a new system will not be useful if it is full of debris, no matter how much more capacity it has for flooding abatement.[110]

Bibliography

[1] "About Us", last modified 2019, https://rcp.umn.edu/home/what-is-rcp
[2] "RCP selects Scott and Ramsey Counties as Next Community Partners", April 19, 2018, https://rcp.umn.edu/content/rcp-selects-scott-and-ramsey-counties-next-community-partners-0
[3] "Ramsey County 2040 Comprehensive Plan", *Ramsey County,* https://www.ramseycounty.us/sites/default/files/Projects%20and%20Initiatives/RamseyCounty2040_FullDraft_Jan2019.pdf
[4] "Ramsey County 2040 Comprehensive Plan", *Ramsey County,* https://www.ramseycounty.us/sites/default/files/Projects%20and%20Initiatives/RamseyCounty2040_FullDraft_Jan2019.pdf
[5] "Saint Paul-Ramsey County Public Health Climate Change Vulnerability Assessment", April 2016, https://www.ramseycounty.us/sites/default/files/Government/Leadership/Advisory%20Groups/Community%20Health%20Services%20Advisory%20Committee/CCVA_Official_Z23.pdf
[6] "Resilience – Ramsey County 2040", *Ramsey County,* https://www.ramseycounty.us/sites/default/files/Projects%20and%20Initiatives/RamseyCounty2040_Resilience_Jan.19.pdf
[7] "Ramsey County 2040 Comprehensive Plan", *Ramsey County,* https://www.ramseycounty.us/sites/default/files/Departments/Policy%20and%20Planning/RamseyCounty2040_Full%20Draft_Draft_5.10.pdf
[8] "Ramsey County Board Workshop – Energy Workshop, *Energy Governance Team,* https://www.ramseycounty.us/sites/default/files/Government/Leadership/Board%20of%20Commissioners/Board%20workshops%20%26%20discussions/03-19-19%20Energy%20Workshop%20-%20Workshop%20Packet%20-%20REVISED%20FINAL.pdf
[9] "Alameda County – Building Support for an Internal Climate Action Plan", *Bay Area Air Quality Management District,* June 2010, https://www.ca-ilg.org/post/alameda-county-building-support-internal-climate-action-plan
[10] "Hennepin County Sustainable Development Strategy", *Hennepin County,* https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/sustainable-development-strategy.pdf?la=en&hash=DF1186BB067338D0D1286E165A28ED315BB92F95
[11]"Cool County", *Hennepin County,* https://www.hennepin.us/your-government/projects-initiatives/cool-county
[12] King County Strategic Climate Action Plan, November 2015
[13] Miami-Dade County GreenPrint Plan, 2015
[14] Interview with Jennifer Moon, Miami-Dade County, March 26 2019
[15] Interview Chris Kleist, City of Duluth, April 2, 2019
[16] "2018 Minnesota Statutes", *Office of the Revisor of Statutes,* https://www.revisor.mn.gov/statutes/cite/13.025
[17] Kaytie Zimmerman, "5 Things We Know Millennials Want From A Job, *Forbes,* October 1, 2017, https://www.forbes.com/sites/kaytiezimmerman/2017/10/01/5-things-we-know-millennials-want-from-a-job/#215e4b667809
[18] Mandarano, Lynn A. "Evaluating Collaborative Environmental Planning Outputs and Outcomes." *Journal of Planning Education and Research* 27, no. 4 (2008): 456-68. doi:10.1177/0739456x08315888
[19] Innes, Judith E. "Evaluating Consensus Building." *The Consensus Building Handbook: A Comprehensive Guide to Reaching Agreement*: 631-76. doi:10.4135/9781452231389.n18.
[20] Quick, Kathryn S., and Martha S. Feldman. "Distinguishing Participation and Inclusion." *Journal of Planning Education and Research* 31, no. 3 (2011): 272-90. doi:10.1177/0739456x11410979.
[21] Bryson, John & Quick, Kathryn & Slotterback, Carissa & Crosby, Barbara, "Designing Public Participation Processes", February 2013, Public Administration Review, https://www.researchgate.net/publication/314101729_Designing_Public_Participation_Processes
[22] Bryson, John & Quick, Kathryn & Slotterback, Carissa & Crosby, Barbara, "Designing Public Participation Processes", February 2013, Public Administration Review, https://www.researchgate.net/publication/314101729_Designing_Public_Participation_Processes
[23] Ackermann, Fran, and Colin Eden. "Strategic Management of Stakeholders: Theory and Practice." *Long Range Planning* 44, no. 3 (2011): 179-96, http://www.hadjarian.com/esterategic/tarjomeh/2-90/khamesi.pdf

[24] Bryson, John & Quick, Kathryn & Slotterback, Carissa & Crosby, Barbara, "Designing Public Participation Processes", February 2013, Public Administration Review, https://www.researchgate.net/publication/314101729_Designing_Public_Participation_Processes
[25] Bryson, John & Quick, Kathryn & Slotterback, Carissa & Crosby, Barbara, "Designing Public Participation Processes", February 2013, Public Administration Review, https://www.researchgate.net/publication/314101729_Designing_Public_Participation_Processes
[26] "Adapting to Climate Change in Minnesota", *Interagency Climate Adaptation Team,* May 2017, https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf
[27] "Adapting to Climate Change in Minnesota", *Interagency Climate Adaptation Team,* May 2017, https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf
[28] "Adapting to Climate Change in Minnesota", *Interagency Climate Adaptation Team,* May 2017, https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf
[29]"Adapting to Climate Change in Minnesota", *Interagency Climate Adaptation Team,* May 2017, https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf
[30] "Thrive MSP 2040: One Vision, One Metropolitan Region", *Metropolitan Council,* May 28, 2014, https://metrocouncil.org/Planning/Publications-And-Resources/Thrive-MSP-2040-Plan-(1)/ThriveMSP2040.aspx
[31] "Thrive MSP 2040: One Vision, One Metropolitan Region", *Metropolitan Council,* May 28, 2014, https://metrocouncil.org/Planning/Publications-And-Resources/Thrive-MSP-2040-Plan-(1)/ThriveMSP2040.aspx
[32] "Thrive MSP 2040: One Vision, One Metropolitan Region", *Metropolitan Council,* May 28, 2014https://metrocouncil.org/Planning/Publications-And-Resources/Thrive-MSP-2040-Plan-(1)/ThriveMSP2040.aspx (63)
[33] "Risk Assessment", *Minnesota Department of Health,* https://www.health.state.mn.us/risk
[34] "Minnesota Climate Vulnerability Assessment", *Minnesota Department of Health,* October 2014 https://www.health.state.mn.us/communities/environment/climate/docs/mnclimvulnreport.pdf
[35] "Watershed Asset Management Plan", *City of San Diego,* July 19, 2013 https://www.sandiego.gov/sites/default/files/wamp2013.pdf
[36] "Alameda County" ,*United States Census,* July 1, 2018 http://quickfacts.census.gov/qfd/states/06/06001.html
[37] https://www.theatlantic.com/national/archive/2014/04/mapping-racial-diversity-by-county/361388/
[38] "Alameda County" ,*United States Census,* July 1, 2018 http://quickfacts.census.gov/qfd/states/06/06001.html
[39] "Climate in Alameda County", *BestPlaces,* https://www.bestplaces.net/climate/county/california/alameda
[40] "Climate in Alameda County", *BestPlaces,* https://www.bestplaces.net/climate/county/california/alameda
[41] "Alameda County – Building Support for an Internal Climate Action Plan", *Bay Area Air Quality Management District,* June 2010 https://www.ca-ilg.org/post/alameda-county-building-support-internal-climate-action-plan
[42] "Alameda County Climate Action Plan for Governmental Services and Operations Through 2020", *Alameda County,* May 2010, https://www.acgov.org/sustain/documents/climateactionplan.pdf
[43] "Alameda County – Building Support for an Internal Climate Action Plan", *Bay Area Air Quality Management District,* June 2010 https://www.ca-ilg.org/post/alameda-county-building-support-internal-climate-action-plan
[44] "Alameda County Climate Action Plan for Governmental Services and Operations Through 2020", *Alameda County,* May 2010https://www.acgov.org/sustain/documents/climateactionplan.pdf
[45] "Alameda County Climate Action Plan for Governmental Services and Operations Through 2020", *Alameda County,* May 2010https://www.acgov.org/sustain/documents/climateactionplan.pdf
[46] "Alameda County Climate Action Plan for Governmental Services and Operations Through 2020", *Alameda County,* May 2010https://www.acgov.org/sustain/documents/climateactionplan.pdf
[47] "Alameda County Climate Action Plan for Governmental Services and Operations Through 2020", *Alameda County,* May 2010https://www.acgov.org/sustain/documents/climateactionplan.pdf
[48] "Fairfax County Virginia", *Wikipedia,* https://en.wikipedia.org/wiki/Fairfax_County,_Virginia
[49] "Sustainability Initiatives Report", *Fairfax County,* October 2018, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/sustainability-initiatives-report-fy2019.pdf
[50] "Fairfax County General Overview", *Fairfax County,* https://www.fairfaxcounty.gov/demographics/fairfax-county-general-overview
[51] "Fairfax County General Overview", *Fairfax County,* https://www.fairfaxcounty.gov/demographics/fairfax-county-general-overview

[52] "Fairfax County General Overview", *Fairfax County,* https://www.fairfaxcounty.gov/demographics/fairfax-county-general-overview
[53] "Fairfax County General Overview", *Fairfax County,* https://www.fairfaxcounty.gov/topics/about-fairfax-county
[54] "Sustainability Initiatives Report", *Fairfax County,* October 2018, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/sustainability-initiatives-report-fy2019.pdf
[55] "Boards Authorities and Commissions", *Fairfax County,* https://www.fairfaxcounty.gov/bacs/
[56] "Fairfax County Environmental Vision", *Fairfax County,* June 2017, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf pages 3-8
[57] "Fairfax County Environmental Vision", *Fairfax County,* June 2017, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf pages 9-11
[58] "Fairfax County Environmental Vision", *Fairfax County,* June 2017, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf pages 17-18
[59] "Fairfax County Environmental Vision", *Fairfax County,* June 2017, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf page 20-21
[60] "Fairfax County Environmental Vision", *Fairfax County,* June 2017, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf page 24
[61] "Fairfax County Environmental Vision", *Fairfax County,* June 2017, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf page 28-29
[62] https://www.fairfaxcounty.gov/environment/cool-counties
[63] "Fairfax County Environmental Vision", *Fairfax County,* June 2017, https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf page 31-33
[64] "Cool Counties", *Fairfax County,* https://www.fairfaxcounty.gov/environment/cool-counties
[65] "Hennepin County Sustainable Development Strategy", *Hennepin County* https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/sustainable-development-strategy.pdf?la=en&hash=DF1186BB067338D0D1286E165A28ED315BB92F95
[66] "Hennepin County Sustainable Development Strategy", *Hennepin County* https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/sustainable-development-strategy.pdf?la=en&hash=DF1186BB067338D0D1286E165A28ED315BB92F95
[67] "Hennepin County Sustainable Development Strategy", *Hennepin County* https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/sustainable-development-strategy.pdf?la=en&hash=DF1186BB067338D0D1286E165A28ED315BB92F95
[68] "Hennepin County Sustainable Development Strategy", *Hennepin County* https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/sustainable-development-strategy.pdf?la=en&hash=DF1186BB067338D0D1286E165A28ED315BB92F95
[69] "Hennepin County Sustainable Development Strategy", *Hennepin County* https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/sustainable-development-strategy.pdf?la=en&hash=DF1186BB067338D0D1286E165A28ED315BB92F95
[70] "Hennepin County Sustainable Development Strategy", *Hennepin County* https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/documents/sustainable-development-strategy.pdf?la=en&hash=DF1186BB067338D0D1286E165A28ED315BB92F95
[71] "Cool County", *Hennepin County,* https://www.hennepin.us/your-government/projects-initiatives/cool-county
[72] "Cool County", *Hennepin County,* https://www.hennepin.us/your-government/projects-initiatives/cool-county
[73] "Cool County", *Hennepin County,* https://www.hennepin.us/your-government/projects-initiatives/cool-county
[74] "King County", *Wikipedia,* https://en.wikipedia.org/wiki/King_County,_Washington

[75] "Demographics", *King County,* December 2018, https://www.kingcounty.gov/~/media/depts/executive/performance-strategy-budget/regional-planning/Demographics/Dec-2018-Update/KC-Profile2018.ashx?la=en
[76] https://www.kingcounty.gov/~/media/Council/documents/2019/council_bro_2019.ashx?la=en
[77] "Biography", *King County,* January 30, 2018, https://www.kingcounty.gov/elected/executive/constantine/about/biography.aspx
[78] "King County Strategic Climate Action Plan", *King County,* June 2016 https://your.kingcounty.gov/dnrp/climate/documents/2015-annual-report-scap-06-2016.pdf
[79] "Strategic Climate Action Plan", *King County,* November 2015, https://your.kingcounty.gov/dnrp/climate/documents/2015_King_County_SCAP-ActionPlan-Section2.pdf
[80] "Strategic Climate Action Plan", *King County,* November 2015, ttps://your.kingcounty.gov/dnrp/climate/documents/2015_King_County_SCAP-ActionPlan-Section2.pdf
[81] "Implementation Plan for a Carbon Neutral King County Government", *King County,* February 28, 2019, https://www.kingcounty.gov/~/media/services/environment/climate/documents/190228-operational-carbon-neutral-plan.ashx?la=en
[82] "Equity and Social Justice Strategic Plan", *King County,* https://aqua.kingcounty.gov/dnrp/library/dnrp-directors-office/equity-social-justice/201609-ESJ-SP-FULL.pdf
[83] "Miami-Dade County At-A-Glance", *Miami-Dade County,* July 2018, https://www.miamidade.gov/information/library/at-a-glance.pdf
[84] "About Miami-Dade County", *Miami-Dade County,* https://www8.miamidade.gov/global/disclaimer/about-miami-dade-county.page
[85] "About Miami-Dade County", *Miami-Dade County,* https://www8.miamidade.gov/global/disclaimer/about-miami-dade-county.page
[86] Suzanne Rowan Kelleher, "How Often Hurricanes Make Landfall in Florida", December 12, 2018, https://www.tripsavvy.com/how-often-do-hurricanes-hit-florida-3266726
[87] "Know Your County Government", *Miami-Dade County,* https://www.miamidade.gov/humanresources/library/know-your-county-government.pdf
[88] "Government of Miami-Dade County", *Wikipedia,* https://en.wikipedia.org/wiki/Government_of_Miami-Dade_County
[89] "About Us", *Miami-Dade Green,* http://www.miamidade.gov/green/about.asp
[90] "Welcome", *Southeast Florida Climate Compact,* http://www.southeastfloridaclimatecompact.org/
[91] "What is the Compact", *Southeast Florida Climate Compact,* http://www.southeastfloridaclimatecompact.org/about-us/what-is-the-compact/
[92] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf
[93] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf page 24
[94] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf page 34-35
[95] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf page 42-43
[96] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf page 51-52
[97] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf page 58
[98] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf page 65
[99] "Miami-Dade County GreenPrint Our Design for a Sustainable Future", *Miami-Dade County,* December 2010, https://www.miamidade.gov/greenprint/pdf/plan.pdf page 76-77, 82
[100] "City of Duluth", *Minnesota Compass,* 2017, https://www.mncompass.org/profiles/city/duluth
[101] "Median Income", *Minnesota Management and Budget,* https://mn.gov/mmb/mn-dashboard/economy/median-income/

[102] "Lake Superior Fun Facts", *Minnesota North Shore Visitor Guide,* May 10, 2018, http://www.northshoreinfo.com/lakesuperior/
[103] "Duluth Facts", *Visit Duluth,* https://www.visitduluth.com/media/quick-facts-local-contacts/duluth-facts/
[104] Bill McAuliffe, "Duluth's flood recovery will involve upgrades to sewers, fish habitat", *Star Tribune,* June 9, 2013, http://www.startribune.com/duluth-s-flood-recovery-will-involve-upgrades-to-sewers-fish-habitat/210773501/
[105] Brady Slater, John Myers, Peter Passi, Lisa Kaczke, "The Flood of 2012, three years later", *Duluth News Tribune,* June 19, 2015, https://www.duluthnewstribune.com/news/3769536-flood-2012-three-years-later
[106] Brady Slater, John Myers, Peter Passi, Lisa Kaczke, "The Flood of 2012, three years later", *Duluth News Tribune,* June 19, 2015, https://www.duluthnewstribune.com/news/3769536-flood-2012-three-years-later
[107] Bill McAuliffe, "Duluth's flood recovery will involve upgrades to sewers, fish habitat", *Star Tribune,* June 9, 2013, http://www.startribune.com/duluth-s-flood-recovery-will-involve-upgrades-to-sewers-fish-habitat/210773501/
[108] "NOAA Atlas 14 – Precipitation Frequency Estimates", *Minnesota Department of Natural Resources,* https://www.dnr.state.mn.us/climate/noaa_atlas_14.html
[109] Interview Chris Kleist, City of Duluth, April 2, 2019
[110] Interview Chris Kleist, City of Duluth, April 2, 2019